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Methods of Boiling Off Silk*

Classification of Degumming Methods—Boiling Off Skeins—Skeins Immersed, Moved by Hand—Degumming by Foam Machine—Piece Goods in Box, Single Bath—A Double Bath Boil-Off Process —Advantages of the Counter-Current System.

By W. W. BRAY, J. B. CROWE and S. MEEKER

THE degumming of silk, which basically involves the removal of the gum that coats the silk fiber, is enormously complicated by the sensitive nature of the fibroin itself and by the value of the product. Because of the chemical similarity between sericen and fibroin, any agent that will remove the gum will also have some effect, however slight, on the fiber. Because silk brings a high price, the utmost care must be taken to prevent injury that will depreciate its value.

Neither of these reasons, however, has succeeded in eliminating carelessness from human nature, nor in establishing a system of control to minimize the effects of this carelessness. The first is impossible; the second is a logical and necessary procedure.

In order to maintain a control system, there must first be established a standard of operation, an ideal at which to aim. It rests with the individual plant whether to boil off skeins by hand in a box or on a foam degumming machine. But for either process there are certain standards of operations which produce the best results, and which apply to all plants.

Accordingly, this paper is devoted to a comparison, so far as data are available, of the more common mtehods of boiling off silk that are now in use, with comments as to what seems the best practice in each case.

Classification of Degumming Methods

Silk is boiled off in the form of skeins, woven pieces and knit goods. (In this paper no discussion of knitted apparel will be attempted.) Although the problem of gum removal is much the same for both skeins and piece goods, methods of handling must be entirely different. Probably, also, there are almost as many variations on basic methods as there are plants boiling off silk.

In some places operations will be found very much like practices of 150 or 200 years ago. In others, the latest types of machinery have been installed to cut costs and improve, if possible, the product. All sorts of modifications and combinations exist between these two extremes, according to the specific nature of the work handled and the ideas of the individuals in charge.

Since most of these modifications are slight, no attempt will be made to present a complete list. Instead, the elements of those processes differing in principle will be analyzed in an effort to reach a better understanding of their operation.

Methods of Boiling Off Skeins

Although at one time practically all silk was degummed in skein form, changes in styles, bringing popularity to fabrics woven of tightly twisted threads, have in recent years reversed conditions, so that now a far greater portion is degummed in the piece. Jacquard and other pattern weaves, decorative effects, ingrain work and various miscellaneous uses, such as insulation, account for the skein-degummed silk of to-day.

As a comparison with present-day methods, it is interesting to read an account of an old-time process that was translated from a French treatise about 150 years ago:

"The silk was made into skeins or hanks and then tied in bundles for easy handling. An oval copper (tank) was set to heat with a sufficient quantity of river or any other soft water fit to dissolve Marseilles soap in the proportion of 30 pounds to a hundredweight of silk. The soap being dissolved by boiling,

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the copper was filled with cold water, the door of the furnace shut, and a few embers left under to keep the liquor hot, but not boiling; for if the liquor boiled, it would open the silk and make it flossy, especially fine silk. While the liquor was preparing, the bundles were passed on sticks. As soon as the liquor was ready, the silk was put in and left in the soapy liquor as long as necessary to divest it of its gum, which was known by the whiteness and flexibility the silk acquired by losing it. It was then turned on the sticks to make the part that had not been soaked undergo the same process.

"The silk thus cleansed of its gum was twisted on the skeining pin to take the soap out, and then passed between the hands to unravel and open it. A cord was passed through the bundles to keep them together during the boiling, and eight or nine of these bundles of silk were passed on each rope. This done, the silks were put in bags or pockets of coarse, strong linen, which were 14 or 15 inches broad and 4 or 5 feet long, closed up at the two ends but open on the side the whole length of the bag. The silk was then put in the bag and the slit in the side of the latter was sewn up. Each of these bags or pockets contained 25 or 30 pounds of silk.

"Then a fresh soap liquor was prepared with the same quantity of soap for each hundredweight of silk, and when the soap was thoroughly dissolved and the boil stopped with cold water the pockets were put in and the copper made to boil strongly for one and one-half hours. While it boiled, care had to be taken to stir it often. This was done by means of a wooden pole, making the undermost bags come to the top to prevent the silk from burning by remaining too long at the bottom of the copper. This process also made the liquor penetrate more equally and speedily."

Apparently boiling off silk was a tough proposition in those days. However, except for the help of steam for heating, some plants even now make almost as hard work of it.

Skeins Immersed, Moved by Hand

In the modern development of the process just described, silk skeins are looped over sticks which rest on the sides of a rectangular box and hang so that most of the skein is immersed in a hot soap solution. The skeins are moved back and forth in the tub and occasionally turned by hand to obtain complete immersion of all the silk, until the gum is removed.

The box or tub may be of wood or Monel metal. The latter is perhaps preferable, since it combines resistance to corrosion with ease of cleaning. Flexibility in operation is thus gained, since the boil-off box can be used as a dye tub, and quick changes from one color to another are possible. If wood is used, it should be a 3-inch dressed cypress. Worth-while protection to the silk is gained by lining the sides and bottom with 8-ounce duck, but in this case the box can hardly be used for dyeing. For a convenient operating unit of 100 pounds of silk the box should be 24 inches wide, 30 inches deep and 12 to 14 feet long.

These dimensions will permit a quantity of water between thirty and forty times the weight of the silk, which is in the correct range. If the water amounts to more than fifty times the silk weight, the soap is so diluted that its effectiveness is reduced; if less than twenty-five times, circulation is apt to be difficult. It should be unnecessary to emphasize the desirability of water that is soft and free from iron or other impurities.

The sticks from which the skeins are suspended may be sections of bamboo or round poles of well-polished hardwood. Smoothness is all-important; the least tendency to splinter offers danger to the silk. Bamboo poles do not splinter, but on repeated wetting and drying they split open lengthwise, which is very nearly as bad.

The soap required for complete degumming will depend a great deal upon the nature and type of the silk. Skein silks not only show more variation than piece goods in their sensitivity toward soap, but the effects of this variation are not overcome, as in the latter, by tightly twisted threads. Figured on the weight of silk, the soap, on a bone-dry basis or as flakes containing only 3 or 5% moisture, may range from 10 to 25%. The requirements of each type of silk handled can be determined by simple experiments and should be recorded for future guidance. In general, however, a very satisfactory average may be struck at 20% dry flake soap, corresponding to 28% of the bar form.

The soap should, of course, be accurately measured for each boil-off according to the weight of silk taken. Undoubtedly the simplest way of doing this is to put the soap into concentrated solution, preferably piping the liquid by gravity to the point of use or carrying from a near-by storage tank. If the soap is sufficiently low in titer, a solution as concentrated as 2 pounds to the gallon can be kept in the cold as a fairly thin liquid, without a settling out of the white precipitate of solid fat soaps that occurs from even a less concentrated olive-soap solution. Measurement of the soap in liquid form is far quicker and more accurate than by scales, which are very apt not to be dependable.

After the soap has been added and boiled for thorough solution and mixture, the boil is stopped and the silk entered. Ten skeins, enough for two handfuls, are hung on each stick, wet out by gently drawing back and forth on the surface of the liquid, and allowed to sink by their own weight.

In order to obtain thorough circulation through the inner fibers, some movement of the skeins is necessary. There is no need for continuous motion from end to end of the box during the boil-off. Attack on the gum

proceeds with sufficient rapidity while the silk is hanging stationary, provided the silk is not crowded by having the sticks pushed too tightly together. Turning the skein, which is necessary since a part of the loop is always above the liquor, is also a very critical part of the procedure and requires experience to perform smoothly and without tangling skeins or threads. A skein can be rotated about one-third of its circumference on each turn. In general, after the wetting-out movement a routine of move, turn, move, and lay up for boiling up the solution, repeated three times, should be sufficient.

The Time Required

The time required for complete degumming depends a great deal on the temperature that can be maintained. The bath cannot be boiled, since to do so would tangle the skeins very quickly. If, as is widely practised, the steam is completely shut off while the silk is in, the temperature will fall very rapidly and the process must be interrupted two or three times to boil up the soap liquor. In one particular case where forty-five minutes was allowed from entry of silk to lay-up, the temperature dropped from the boil, 212°, to 165°. In such a case—and similar conditions are very common—probably not more than the first third of the forty-five-minute period was maintained at a temperature high enough for efficient degumming. Therefore, the interval between one boil-up and the next should be not longer than thirty minutes, and may even be less.

Hence there is a large advantage in equipment which enables a constant temperature near the boil to be maintained. If the boil-off box is fitted with a closed steam coil, to which the admission of steam is controlled thermostatically, an even temperature of 205 to 210° can be held during the whole operation. The silk need not be laid up, so time is saved and handling reduced. Considering that efficient degumming takes place during the whole time, it should be possible to cut the time of the lay-up method at least in half. Even without automatic control, an alert operator with a thermometer can adjust the steam on a closed coil so as to keep a high temperature without actual boiling. A little extra supervision at this point will be well repaid by increased speed of degumming and consequently greater production from a given equipment and labor force.

The above method of degumming skeins is capable of results second to none other, especially if varied to the extent of passing the silk through successive soap baths in a manner similar to that described later on for piece goods. It requires a relatively small capital outlay for equipment, but suffers from limited production and high labor costs.

In order to lower the labor costs and eliminate some of the chances for damage to the silk that accompany the older methods, machines have been perfected which, by rotating the skeins about specially constructed arms in a hot foam from a concentrated soap solution, perform the degumming very efficiently.

The machine consists of an iron or Monel-metal tub or box, across the top of which projects a row of arms made of fluted porcelain or Pyrex glass. These arms can be rotated by a suitable driving mechanism so as to change the position of the silk slowly and gently.

The degumming medium used in this process is a soap foam or suds generated from a solution containing from 0.5 to 1% anhydrous soap. The proportion of soap to silk is about the same as in other methods —namely, approximately 20% of a dry flake soap. The liquor can be reused frequently until four strips have been made in succession.

The skeins are looped over the arms, and in this position hang so that the lowered end is a short distance above the level of the soap liquor. Closed steam coils heat this solution until it boils vigorously. This agitation produces a dense foam which rises about the skeins and proceeds to attack the gum. The bubbles of the foam enclose hot steam; the bubble walls are equally hot soap solution. When the foam touches the silk, the steam condenses and the foam collapses, wetting the silk with fairly concentrated soap solution at a temperature very near that of boiling. This soap solution, of course, attacks and dissolves the gum, and the liquid mixture drains down the skein and drips back into the body of the liquor. This circular movement—hot foam produced, rising to meet cool air, condensing on the silk, stripping off the gum and falling back to its source—goes on continuously and degums the silk quickly and thoroughly.

This system of boiling off possesses the following distinct advantages:

1. Degumming time is considerably lowered, thirty minutes sometimes being sufficient.
2. Most of the hand labor is eliminated.
3. The likelihood of mechanical injury to the silk is greatly reduced.

Against these must be balanced the high initial cost and subsequent carrying charges of the machine, together with the auxiliary equipment, such as storage tanks for the gum soap, heating apparatus for rinse water, etc. For a plant of large capacity, however, such an installation seems a very worth-while investment and a distinct advance in efficiency.

Piece Goods in Box, Single Bath

This is the usual method practised by the majority of piece dye works. Large wooden or metal boxes, fitted with steam coils, are filled with soap solution which is heated to the boil. Folded pieces of silk, suspended from sticks by strings through the selvedge or reeled about the sticks in skein fashion, are hung in this

liquor, which can be kept at a slow boil, and moved back and forth until the gum is removed. As a rule several strips are given successively in the same liquor, which may be reinforced with soap as becomes necessary.

If the silk has been woven with a good selvedge, it should by all means be hung on strings, since in this way better circulations can be obtained throughout the folds. If sewing is not done with care, irreparable damage may be caused by holes or pulled-out strings. The string should pass through the selvedge only as far from the edge as possible, catching each fold of the piece at a distance of 8 or 10 inches from the sides of the folded square so as to avoid permanent crease marks. Loops between alternate folds should be pulled out and passed over the sticks, of which two should be used for each piece, to permit spreading the folds in the boil-off.

To avoid creasing the folds unnecessarily, the piece should not be rolled about the sticks, but should be laid flat until the boil-off is ready and carried in this manner to the box. Since the silk will wet out and sink but very slowly by its own weight, it is advisable to hasten this process by pressing down with short, rubber-capped poles placed firmly against the lower half of the piece. This method of immersion can be applied at various points in the boiling off and rinsing, but, like everything else, must be done with care. The poles should not be used to poke but to press—firm, slow pressure causes no injury, but sudden, jerky movements may spread the weave or shift the face of a satin.

Piece goods should be moved in the boil-off with as much care as skeins, since it requires but very little friction between the folds of silk to cause chafing of the swollen, sensitive fibers. Some operators feel that it is necessary to keep the silk in continuous movement, and in moving to swing the sticks vigorously from side to side, swishing the silk about on the surface of the bath. A little thought will show that this is entirely unnecessary. The purpose of moving the silk is to obtain circulation between the close-hanging folds. This can be done very effectively if the two sticks on which each piece is hung are, with one slow, even movement, carried sideways so the piece moves into the free space of the box, is spread about 18 inches to open the folds, and is lifted 8 or 10 inches to cause the liquor to surge between the folds. Then the piece should be allowed to sink of its own weight, the sticks rested on the edge of the box and pushed slowly across the remaining distance to the other end of the box. If this is done carefully the bottom of the piece will not be brought up to the surface, no tangling of folds will occur, and no swinging or yanking at the silk will be necessary to straighten them.

The load of silk should be so proportioned to the box size that there is left sufficient room to move the silk as described above without having the mass of pieces pressed too closely together at one end of the box. If the sticks are left a few inches apart, there is opportunity for the liquor to circulate through the resting pieces and less moving is necessary. The quantity of water should be from forty to fifty times the weight of the silk. As a typical average figure, 60 or 65 pieces, weighing about 500 pounds, are a good load for a box of 2,500 gallons capacity.

Soap Requirements

The soap requirements for this work will run pretty close to an average of 20 to 22% flake or 28 to 30% bar soap on the weight of the silk. Since a number of strips are to be given in one liquor, the total weight of silk to be boiled off should be taken into consideration in making up the bath. Usually four strips or batches are possible in one bath. Assuming that there will be 500 pounds of silk to each strip, a total of 2,000 pounds, 400 pounds of soap will be required. There are three possible ways of adding this soap as follows:

1. Distributed equally over each strip.
2. A large proportion, say half, at the start with the remainder distributed equally over the other strips.
3. The entire amount at the beginning.

Careful experiments have shown that the first suggestion is not as effective as the latter two, between which no difference in results can be detected. Practically, the second is preferable, since it permits accommodation of the soap usage to variation in the loads of silk.

The reason for the better results of the second and third methods is found in previously reported work which showed that increasing the ratio of soap up to 40% of the silk caused more rapid as well as more thorough degumming.

Although this method is widely used, it has several very serious objections:

1. *Accumulation of Fatty Acid or Acid Soap.*—As degumming progresses, the alkaline portion of the soap is gradually used up by chemical combination with the sericen. The fatty portion of the soap, thus set free, builds up in the bath as fatty acid or acid soap. In either case, it lowers the degumming efficiency by repressing the hydrolysis of the remaining soap. Moreover, since it behaves just like so much added oil, it requires soap for its emulsification and reduces the effectiveness of the liquor toward oils on the silk.

The result is that each succeeding strip needs a longer time to complete degumming. Whereas the first batch may be thoroughly boiled off in, say, an hour and thirty minutes, the fourth needs three hours or possibly longer to reach the same state.

2. *Accumulation of Coloring Matter.*—Since most of the silk used in weaving is either tinted or naturally col-

ored, or both, this color must be completely boiled out before the silk can be dyed. Fresh soap does this to perfection, but as the color compounds accumulate and the efficiency of the soap decreases, the bath becomes very dark in color and less effective in stripping the tints or gum color. The result is that the first strip comes out as light as the nature of the silk will permit, while following strips bear a darker cast, which may be so bad from the final boil that the silk can go only into dark shades. Even under the best conditions, there will be a noticeable difference in the color of successive strips on the same silk.

3. *Formation of an Oily Scum.*—Practically all silk has been treated with oil emulsions to soften and lubricate the thread. In the boil off this oil is removed from the silk without much trouble, but since the bath is not continuously agitated, it is not held permanently in emulsion. As the amount becomes greater with each strip, this oil tends to cream out on the surface as a scum, which may easily be caught on the silk as it is lifted out of the box. Once fastened, it is there to stay, unless removed by hand treatment, and appears as unsightly spots after dyeing.

A Double Bath Boil-Off Process

In order to eliminate these drawbacks that are a part of the single-bath method of degumming, a process has been developed and applied by which the silk is boiled off first in a partially exhausted soap liquor, and finished in a bath of fresh soap. In operation this system approximates a counter-current flow of silk and soap liquor: raw silk enters partly spent soap and emerges completely degummed from fresh soap.

A plant unit for this process requires three boxes, two for soap and one for rinse water. These are preferably set end to end, so that the silk may most conveniently be carried from one to the next. Assume the boxes to be of 2,250 gallons capacity and the weight of silk in each strip 500 pounds. To prepare the liquors for continuous operation, the first box (A) is made up with from 2/3 to ¾ of the weight of soap necessary to boil off four lots of silk. Since under the chosen conditions four strips will amount to 2,000 pounds of silk, the total soap will be 400 pounds (20%), of which 260 to 300 pounds will be dissolved in preparing the first bath. The 500-pound load of silk is placed in this liquor, moved in the correct manner, and boiled until about 80% of the gum is removed. This will require about 45 minutes, during which time the second box (B) is prepared in the same way as box A. At the end of the preliminary boil, the silk is lifted from box A, drained slightly and immersed in box B, where degumming is completed in a short time. The silk passes on to box C for rinsing.

A second lot of 500 pounds of silk meanwhile has been started in box A, where, as before, the greater portion of the gum is stripped off. It is then transferred to box B for removal of the remainder of the gum.

After two more lots, making a total of four, have been degummed in the same way, the liquor in box A is run to the recovery tanks. (Probably no more soap will have been necessary for this bath since it was made up fresh and used to start the routine of operations.) A fresh solution using the same weight of soap as before, 270 to 300 pounds, is now made up in this box.

At this point, two solutions stand ready for the start of the continuous cycle of the process. Box B contains a soap liquor which has been used to finish the degumming of four lots of silk and is just slightly exhausted. Box A contains fresh soap. A new lot of silk is boiled in box B for about one hour and transferred to box A, where it is boiled for another hour to finish the degumming. Three more lots are passed through both boxes in the same way, after which the soap liquor in B, completely exhausted, is pumped to the recovery system. Box A now holds the slightly used soap, so the raw silk is started here and finished in a fresh soap in box B.

Thus a continuous counter-current cycle is set up. Raw silk is about 75% degummed in "used" or partially exhausted soap, and finished in a fresh soap. Eight lots of silk pass through each box, and either box in turn is successively a fresh soap and a used soap.

Soap additions are made as reinforcements after each strip, just as in a single-bath method, except that the remainder of the 400 pounds is distributed over seven strips. A concentrated solution is the most convenient form for introduction of the reinforcing soap.

Advantages of the Counter-Current System

The advantages of this process are numerous and definite. They are listed and discussed herewith:

1. More uniform boiled-off silk is obtained. This applies both to sericen and coloring matter. Since each lot of silk completes its boil off in practically fresh soap, both gum and color are entirely removed, and the fourth strip is indistinguishable from the first. This was very plainly shown by a thorough experimental study in which this process was compared with the single-bath method, using strips from the same piece of silk for both series of boil offs. A wide difference in color was noticed between the first and fourth strips of the single boil off, while those which had received the double bath were almost exactly the same shade throughout. Although enough soap was used to boil off both series completely, the latter method provides a factor of safety against the possibility of gum remaining.

2. A standard routine of operation and time of boil off are established. The process needs careful planning out, but when once on an operating basis it leads to smoother and more dependable production.

3. Oil spots are eliminated. Since the oil is emulsified in the first bath, practically all of it remains there. If any does carry over when the silk is transferred, the small amount in the second bath of fresh soap is easily taken care of.

4. A 10% reduction in soap consumption is possible. In the experimental work described above, a silk was used which was not completely boiled off in a single-bath process with 20% soap. The third strip retained 3% gum and the fourth strip 6%. Twenty-two per cent soap was required for satisfactory results. When the recommended method was used with 20% soap, however, every strip was completely boiled off. A figure of 20% soap was used in describing the method for the sake of round figures. But since this is usually satisfactory for single-bath degumming, the double bath will require only 18%.

There can be no question of the fact, then, that a double bath, counter-current system of boiling-off silk means greater production, improved silk, more regular operating conditions and a saving in soap. It can be recommended as the best method for degumming that has yet been devised.

HEALTH SERVICE IN MILLS

In its program of national services conducted throughout the year, there are a number of points at which the American Red Cross maintains contact with industrial groups, including the textile industry.

One of the most important contacts of this association is through the Red Cross Public Health Nursing Service and through instruction in home hygiene and care of the sick. A number of mills in various sections of the country maintain their own nurses, others co-operate with the Red Cross chapter in their locality and assist in maintenance of a nurse who will serve the mill workers as well as the community generally. In certain instances the Red Cross public health nurse in communities where there are textile mills works with their employees simply as a part of her community work.

Operators of textile mills have proven very co-operative in all instances with their local Red Cross chapters. A number of them, besides making use of the nursing services, encourage their workers to take advantage of the Red Cross instruction course in home hygiene, giving girl and women workers the chance to study on "mill time," making transportation available, etc. Some of these mills have organized recreational trips, picnics and similar events for their workers, with Red Cross assistance. Others, in addition to active interest in Red Cross service of this kind, assist the chapter with its annual membership roll call, when the membership upon which most Red Cross service depends for support is enrolled. The Twelfth Annual Roll Call, incidentally, will continue until November 29 this year, and five million members are asked for.

At Hickory, N. C., the mills utilize the Red Cross nursing service and contribute about $1,000 annually toward support of this activity, which is sponsored by the local Red Cross group these. A county nursing service, which reaches mill employees as well as others, is maintained at Concord, N. C., while valuable services are carried on by Red Cross nurses at Fayetteville, N. C., and other textile centers in the South, including Columbia, S. C.

For some months the past year, at Biddeford, Me., the Red Cross had a nursing service, the expenses of which were shared by the mills. The nurse here paid bedside visits to absentee workers when they reported ill; assisted with eye cases, physical defects generally, and did welfare work. She also influenced the food vendors at luncheon time in the mills to provide certain health-giving fruits and milk in addition to the customary diet.

Mills have been generous in all instances in donating the use of their space for useful Red Cross activities, such as instruction, etc. Nutrition instruction has been given to groups of women in some centers to give them a better idea of wholesome foods, and first-aid training promises to become popular, though textile mills do not regard it as essential in all cases.

In a Nebraska city, women employees in all fields of work—laundries, garment establishments, stores, public utilities and similar concerns—were organized for study of first aid under a woman physician serving as Red Cross instructor. This indicates another field of usefulness which the Red Cross is able to serve, as it has served men workers in many industrial groups.

GEIGY ISSUES FOLDERS ON WOOL COLORS

Three handy color card supplements have been issued on "Dyestuffs for Wool" by J. R. Geigy Soc. An., of Basle, Switzerland, and are being distributed by the Geigy Company, New York. The first deals with acid colors, and displays nine recent products on wool swatches ranging in shade from yellow to black, with a chart of their fastness properties and directions for dyeing. The other two folders show in the same manner the Erio fast colors, polar colors and chrome colors. These folders are supplements to the Geigy Color Card on Dyestuffs for Wool, Second Edition.

OAKITE STAFF IN CONFERENCE

The technical staff, field service men and executives of Oakite Products, Inc., met in the general offices in New York, November 14 to 17, on the occasion of their annual sales conference. The meeting marked the completion by the company of twenty years of industrial cleaning service.

Nineteen papers on technical, sales and service topics were delivered, followed by informal discussion and an interchange of experiences. The subjects before this gathering ranged from problems of cleaning such diverse products as watch crystals and ocean liners, silk stockings and storage tanks. The papers dealt with cleaning service in a score of industries, and were supplemented by interesting addresses on sanitation and cleaning by several industrial journal editors and others whose duties bring them into close contact with cleaning problems.

Some Notes on the Dyeing of Piassava

Origins and Uses of the Fiber—The Bleaching Process—Dyeing with Basic Colors

By FRED. GROVE-PALMER, A.I.C.

THAT class of industrial fibers which is known as Piassava finds its principal employment in the manufacture of brooms and brushes for household and other uses, but a large proportion of the more delicate grades are frequently used in the making of coarse textile fabrics of a nature not dissimilar to those which are produced from the outer fibers of the cocoanut; some of it also consumed in the production of sun blinds.

The fiber is one of the natural products for which we are indebted to South America, its principal source being two distinct species of palm trees, both of which are members of the natural order: *Palmae*. The better quality in which the fiber is very much finer than in the other is graded on the market as Para Piassava; it is obtained from the enveloping or sheath-like covering of the young growing leaves of the *Leopoldina piassaba,* a plant which is indigenous to the Brazilian forests.

When this sheath has fulfilled its object in life, which is the task of preserving the young fronds from injury in their early stages, it fades and droops down in a rough raggedy mass against the bole of tree, and it is when it is in this condition that it is ripe for gathering by the natives who go around searching for it.

The second grade which is considerably coarser in texture is found in the leaf bases of a tree called *Attalea funifera,* from which are obtained those hard coquilla nuts which are shipped in large quantities to all parts of the world for the use of turners and carvers who employ them in the manufacture of small knobs, handles, and other little articles of a similar nature.

These Piassava fibers may be placed among the most important of the heavy fibers which come on to the market, especially in reference to the bass-broom industry, for which purpose they are exported to all countries. Their natural color is black or a very dark brown when they are brought in by the natives. The trees from which they are obtained are also to be met with in various parts of tropical Africa, and though there is little done in way of exporting them at present, the natives make a considerable use of them for thatching the roofs of their shacks and other domestic purposes.

The quality which is known as *Bahia piassava* forms the stalks of the leaves of a palm tree that bears pinnate leaves and grows abundantly in the rank vegetation of the swamps that border the rivers in the province of Bahia, Brazil. It requires very little preparation for the market, as when it has been "dead" a short while it separates naturally from the stalks of the leaves and forms a heavy curtain of coarse, but very flexible flat strands. These are cut off in great bunches by a single sweep of the machete. The bundles are taken to a clearing in the forest and rolled under a wooden log in order to clear out any short pieces of fiber, dead leaves and other débris, and then roughly carded with a long-toothed rake so as to bring the fibers into a more or less tidy condition, and after that they are baled up for shipment.

Perhaps the greatest use of this class of Piassava is in the making of heavy brooms for the street scavengers and cleaners, for which purpose the exceeding toughness and resilience of the fiber renders it particularly valuable.

Para Piassava, to which reference has already been made, is also called in some quarters "Monkey Bass." When this is taken from the tree it is in the form of long, heavy bands; these need to be pounded by natives in preparation for sale, and after this has been continued for some time the ribbons separate out into fine fibers that are almost circular in section and measure nearly two yards in length.

There is still another variety which is known as *Madagascar Piassava;* this kind is obtained from the leaf stalks of palm called *Dictyosperma fibrosum,* which is found growing in many parts of the island of Madagascar; it is far less coarse and very much more flexible than the Para variety, and is the grade that is employed in the manufacture of mattings and other coarse textile fabrics.

When Piassava is used for the making of brooms it is not usually considered necessary to dye them, but when it is employed in the manufacture of mattings and sun blinds it is practically always colored to a greater or less extent.

Bleaching the Fiber

The natural dark brown or black color is partly bleached out by soaking the fibers in hot water and then steeping them for some hours in a bath containing eau de javelle (sodium hypochlorite); this treatment is followed by a further soaking in a weak acid bath, either hydrochloric or sulphuric acid may be used here. Another method is to steep the masses of fiber in a hot solution of potassium permanganate and after allowing this to drain off and the fiber to become oxidized by exposure to the atmosphere, the batch is soaked in sulphurous acid until a considerable part of the brown coloration has been removed.

Although the fiber is usually received in a condition which does not call for retting, it may happen that in some instances this is needful when the demands of the

business call for a fiber in a more finely divided state. Experiments in this direction have proved that this ideal may be best obtained by steeping the mass in a vat containing a solution of from ½ to 1% of bicarbonate of soda for several days, always keeping the temperature closely around 95° F. It has been found that ordinary washing soda crystals (carbonate of soda) has not such a good effect, while the stronger caustic alkali (hydrate of soda) is entirely unsuitable. It is quite easy to ascertain when the operation of retting is completed by lifting a sample from the batch and pouring boiling water over it; if the fibers immediately separate the work has proceeded far enough and the soda solution may be drained off. It is then necessary to wash all traces of it away with hot water, and after allowing the batch to drain again for a while, it is ready to go to the bleaching tank.

Piassava that is required for purposes of weaving may have the coarse fibers broken down to a more convenient fineness by soaking them in a boiling bath containing from 5 to 10% of sulphide of soda for a few hours and then washing very thoroughly with constant changes of hot water to remove the alkali. The effect of this is greatly to soften the fiber and in this state it is heated once in a bath of liquor, but this time the action to which the material is submitted is of an acid nature. For this purpose 10% of alum is usually employed, although a 5% bath of sodium thiosulphate which has been made acid by the addition of a small quantity of sulphuric acid will answer equally well. The very finely divided fibers must now be thoroughly washed again to remove all the chemicals and may then be passed along to the bleachery.

Speaking generally the process of bleaching Piassava is just the same as that employed for jute or cocoa fiber and calls for no special directions other than those already given.

The Dyeing Process with Basic Colors

It is possible to dye Piassava fibers with the basic dyestuffs without the necessity of first treating them with a mordant; there is so much tannin in their make-up that any more is unnecessary. Dyeing is best done in the presence of from 2 to 5% of acetic acid or half that quantity of formic acid. If there is any difficulty in getting a good penetration the amount of acid must be increased; it is the usual practice to start the dyeing cold and gradually raise the temperature as the demands of the coloring proceed, even if it is taken up to the boil.

In the case of acid dyestuffs it is better to start right away at the boil and continue the dyeing for about an hour in the presence of 5 or 6% of alum and from 10 to 20% of Glauber salt. After that the batch is allowed to remain feeding in the cooling bath for a further half hour, then it may be lifted, drained and dried without washing.

With some shipments of Piassava it is found to be very difficult to get good penetration by either of the means just suggested and it is therefore necessary to resort to the use of the substantive or direct dyestuffs belonging to the diamine class, such as Congo, Benzo, Chlorantin, etc. Most of these are good for the purpose and the dye bath should be kept in as concentrated a condition as possible. Always in coloring Piassava, work in a short bath; it saves a lot of time in the handling and it is not a delicate, easily damaged material like silk or rayon. This sort of dyestuff will require the assistance of from ½ to 1% of soda ash (dried carbonate of soda) and anything from 5 to 20% of Glauber salt, depending upon the difficulty of penetration and the depth of shade required. The dyeing is conducted at the boil for about an hour. Working with a concentrated bath as advised here, the baths do not exhaust very well, and it is a distinct economy to keep them as standing vats whenever this is possible; it will be necessary to freshen up for each new batch by the addition of from one to two-thirds of the dyestuff and the other chemicals.

When a somewhat finer appearance is wanted on the Piassava fabrics, a certain amount of glossiness may be imparted to them by dissolving in water a quantity of glue equal to 5% of the weight of the fiber and putting to it an equal weight of crude glycerine and adding the mixture to the dye bath. The object of the glycerine is to give a slightly softer handle and so enhance the quality of the material without damaging its wearing powers in any way. After the dyeing has been finished the glue may be turned into an insoluble compound by immersing the batch in a bath containing 1 or 2% of formaldehyde for a few minutes and then drying. If the arrangement of the factory will admit, it is a far better plan to put the dyed goods still damp but well drained into a cottage and expose them for a short time to the action of the vapors of formaldehyde.

When fibers of Piassava that have been colored with a direct dyestuff, such as Congo Red, are examined in section under the microscope it will be found that the outer ring is strongly colored deep red but the central portion has only a pale reddish yellow shade, indicating that the impregnation of the cellular structure is incomplete, but when the coloring matter employed is one of the basic dyestuffs the fiber is seen to be tinted homogeneously, proving that this class of fiber, as a whole, has a greater affinity for the basic dyes.

A NEW WATERPROOF DYE

According to a recent report of the London Daily Mail, a Japanese savant, Dr. Keiji Oda, professor at the University of Kushu, has been able to dissolve Chinese lacquer in water. This discovery would allow the manufacture of a waterproof dye which could be used for the treatment of silk stuffs, as well as ordinary textiles, and whose use would offer the advantages of waterproofing with rubber.

Proceedings of the American Association of Textile Chemists and Colorists

The American Association of Textile Chemists and Colorists

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OCTOBER MEETING OF THE NEW YORK SECTION

THE October meeting of the New York Section was held on Friday evening, October 26, at the Building Trades Employers' Association Rooms, New York City.

The regular monthly dinner was attended by forty-two members and friends and the meeting proper convened at 8.15 with D. P. Knowland in the chair. The minutes of the September meeting were read and approved, the Treasurer's report was accepted and Mr. Wolstenholm reported on the status of the Membership Committee. Geo. H. Alpers was elected to fill the vacancy on the Sectional Committee caused by the resignation of S. L. Hayes.

The speakers of the evening were Dr. W. T. Anderson, of the Hanovia Chemical Manufacturing Company, and W. D. Appel, of the Bureau of Standards. Both gave very interesting talks on subjects allied to Light Fastness Tests.

Immediately following the business meeting and before the speakers were introduced, a brief Question Box session was held. This was the first opportunity that the Section has had to put this new feature into practice. and, as the following report indicates, the idea proved to be highly practical and the session as a whole instructive. The chairman of the Question Box Committee, P. J. Wood, presented the questions as follows:

The Question Box

Mr. Wood—The first question: "Can you suggest a method of producing a white discharge on tin-weighted silk?"

To which I will reply myself that we have found the use of zinc oxide to be beneficial. I don't believe there is any method of making a white discharge on silk as white as on pure dye silk, but we have found that the addition of a small amount of zinc oxide did help in preserving it.

Mr. Wolstenholm—I have found through practical experience that the addition of 3 per cent soda ash is far superior to zinc oxide. I have tried zinc oxide and now I won't use it at all; but another thing I have also insisted on is not giving the tin-weighted silk any silicate.

Mr. Wood—Can you get it without the silicate and up to what per cent?

Mr. Wolstenholm—Up to 45 per cent.

Mr. Wood—The second question: "Is there any known process for dyeing mixtures of artificial silk and cotton,

leaving the artificial silk lighter than the cotton, or, if possible, clean, without using cellulose in place of rayon?"

Mr. Scott—I can answer it in part, that I know of a few dyestuffs that normally have more affinity for cotton than for viscose and if they are dyed in a cooling bath, the viscose can be made not white, but dyed considerably less than the cotton, but I know of no process that can control it for all dyestuffs.

Mr. Zissman—Does that apply to Bemberg rayon?

Mr. Scott—Only viscose.

Mr. Wood—I think there is quite a little difference in the behavior of the different grades of rayon towards dyestuffs.

Mr. Scott—One of the dyestuffs that will dye cotton heavier than rayon—we dyed on cotton and Bemberg mixtures—dyes the Bemberg heavier than the cotton.

President Knowland—Does anyone know of any blue?

Mr. Wood—Most blues seem to give darker shades on the rayon.

The third question relates to a piece of printed silk dyed brown and discharged white. It shows an uneven appearance. Most of you have had an opportunity of examining it and you see what the defect is. It is more apparent on the back than on the face, although it does show on the face also. These defects in my experience are due to several causes. Sometimes it is a lack of boiling off, some threads don't boil off as readily as the others and they will resist the color to a certain extent.

Very similar effects are produced by sticking in. The color doesn't leave the roller entirely, but in that case the repeat is always the circumference of the roller which is, generally, in silk printing, about sixteen inches. In this case it seems to be haphazard, with no rhyme or reason about it.

If any of you have anything to offer, I should be glad to give the questioner the benefit of any advice.

Mr. Wolstenholm—It is apparent to me that he has been running those goods on a machine with more than one end out on his lapping, and his lapping hasn't been put on evenly. That very distinct mark in the back, I believe, would prove my contention.

Mr. Hayes—It has a white streak, apparently unevenness in the engraving. It is hard to be definite with such a small sample. I thought it was due to unevenness in the lapping and the white streak to unevenness in the engraving.

Mr. Wood—Of course, if it were the lapping, that would be determined by measuring the ends on the lapping and comparing with the mark on the goods.

Mr. Hayes—It would repeat the size of the cylinder.

Mr. Wolstenholm—We know tweeds have been running pretty strong and we have all had more or less trouble with them. I have found by taking the lapping and pulling one end out on them I eliminated a lot of the sketchiness which we have been having.

Mr. Wood—It is the most trying type of pattern we are called upon to print.

Another question is: "Can you suggest a good yellow for printing Celanese which does not mark off either by subliming in the steaming or marking off in the washing?"

We have had some experience with Celanese ourselves, very limited, but we haven't found a yellow yet that is entirely satisfactory. Most of them, and some of the oranges, too, seem to sublime in the steaming. They go through cheesecloth, and if they crease in the washing, while they are wet, they mark off badly.

Experiments in Celanese

Mr. Wolstenholm—I am making some extensive experiments on Celanese. Here is a piece of goods 70 per cent Celanese and 30 per cent rayon. There is no yellow in it, but there is some orange there. They have not been steamed. I wish you would try to crock that.

Mr. Wood—Not steamed—not washed, either?

Mr. Wolstenholm—You can wash it.

Mr. Wood—You don't find sublimation of yellows at all?

Mr. Wolstenholm—I did at first, but I am working to a gradual point where I don't think I will on any of the colors. I am getting away from the steaming part of it.

Mr. Wood—The last problem that was put up to me was a matter of finishing more than anything else. There is a sample here which shows creases. I don't know whether you can see it from here, but they iron out, and seem to return again after the goods cool down. The question is how to treat them in some way so that the creases will disappear. The material is crepe de Chine.

President Knowland—Possibly it was folded too quickly without cooling.

Mr. Wood—I don't know where the inquiry originated. We had similar effects on rayon. If you get a certain kind of crease in them, it seems as if you can never eliminate it when it is once in. I thought somebody else had experience on them and could shed a little light on the matter.

Mr. Hadley suggests that the reason we are only getting silk inquiries is that they never have any trouble in the cotton and wool business.

President Knowland—This is the beginning of the question box and for a starter it wasn't so bad.

We will now listen to a paper by Dr. W. T. Anderson, of the Hanovia Chemical Manufacturing Company, who will speak on "The Light That Fades." Dr. Anderson! (Applause.)

Proceedings of the American Association of Textile Chemists and Colorists

The Light That Fades

By Wm. T. Anderson, Jr., Ph.D.
Hanovia Chemical Manufacturing Company

THE fading of pigments and dyes through the action of light is a factor which concerns all, for fading is one of our most common phenomena. Everyone is interested in producing materials that do not fade; that are light-fast. But very few persons, even those who are studying the problem in the laboratory, appear to have a clear conception of the light that does the fading.

This situation is entirely excusable, for light, while one of our most familiar forms of energy, is the most intangible and complex of them all. Steam or air power can be measured on a pressure gauge, water power by volume and rate of flow, and electricity by a wattmeter. Light energy may be measured by a recording thermopile, but the measurement has ordinarily no meaning, for light unlike the other forms of energy does not depend on the quantity of energy present so much as how the energy is present. Steam, air and water power exist in only one form. Electricity has many hundreds of forms, only one of which, however, is present at any one time. We don't light the incandescent lamps in our homes with electrical energy at 110 volts, 130-cycle, 60-cycle, 40-cycle, 25-cycle A. C. all at the same time. If we tried to, we would have a short circuit with the accompanying fireworks. Light, however, such as our sunlight, consists of many thousands of different kinds of light all present together and all different in their behavior when intercepted by matter. Consequently a measurement of the total light energy alone gives no inkling as to the possible behavior of the light. It is necessary to know the different kinds of light that are present, and the amount of energy available in each.

Measuring in Wavelengths

Our sunlight, which is responsible for most of the fading, consists not only of the light radiations which affect the retina, i. e., visible light, but in addition two sets of invisible radiations, the ultra-violet and the infra red. Each one of these divisions may be further subdivided into hundreds of different kinds of light, each with its particular behavior towards matter. Thus certain of the ultra-violet rays can produce inflammation of the conjunctiva of the eye, others the familiar sunburn, and still others fluorescent effects. The visible white light of sunlight, may be separated into the familiar violet, blue, green, yellow and red of the spectrum.

Light energy is transported in the form of electromagnetic waves. The various kinds of light differ from one another by the frequency of these waves. The frequencies are so extremely high, that the large numbers required to express them are cumbersome. Hence it is customary to employ the wavelengths defined as the ratio of the speed of light in air to the frequency in identifying a light wave. There is another advantage in employing the wavelength, for wavelengths may be experimentally measured whereas frequency cannot.

A determination of the wavelengths present in a beam of light informs the experimenter definitely what kinds of light are present. A measurement of the amount of energy at each wavelength completes the story. These factors are nearly constant for each of the various electric arcs and incandescent lamps; for sunshine they are not. The wavelengths of light and the light energy available in sunlight vary with the time of day, season of the year, locality, atmospheric conditions, and climate. Hence, it is next to impossible to have any accurate data to assist in tests or experiments of any kind involving sunlight. We have to be content with very rough approximations.

In the vicinity of New York there is a very marked difference between the quantities of energy in winter and summer sunshine. This difference is especially noticeable in the ultra-violet, there being approximately eighteen times more ultra-violet in summer than during the winter months. In addition during the winter months certain of the shortest ultra-violet wavelengths are almost wholly missing. These light waves, which are the most transitory of the rays from the sun, are probably among the most important, for they are the most active chemically, and are responsible for the production of vitamin D, without which we would all be like jelly fish.

It is evident that if these short ultra-violet rays of sunlight are in any way responsible for fading, tests made during the summer and winter cannot be expected to give comparable results. Even discounting any effect of the shorter wavelengths, which, of course, cannot be legitimately done, and assuming that intensity is not a factor, the fact that there is eighteen times more total ultra-violet in summer sun than in winter means that exposures in winter must be at least eighteen times longer than in summer. These factors are unfortunately not always considered by those who make sunfading tests.

Atmospheric conditions and dust and smoke affect greatly the quality and quantity of sunlight. Tests made in the smoky districts of a typical manufacturing city fail to predict accurately changes that may occur when the test material is exposed to sunlight in another locality.

Another complication is the variation of sunlight from year to year dependent to a considerable extent on the size, number and location of sun spots.

It can be understood that sunlight is a facetious subject, and that no one should be greatly surprised if a

substance found to be lightfast by sun tests should later become faded.

Geographical Variations in Light

The factors which have been considered make it evident that sun tests made in the smoky sections of Newark, for example, cannot give an indication of fastness in Denver, Colo., where the sunshine, especially the ultra-violet portion, is very much more intense. Such tests cannot even serve as a criterion of behavior to light in the Orange Mountains, only a few miles from where the tests were made. The sunlight in the Orange Mountains is different from that of Newark.

Experience has indicated that the ultra-violet rays and violet and blue light are primarily responsible for light fading. The tendency to fade and the acceleration of fading increases usually as the wavelengths of the ultra-violet become shorter, for the shorter wavelengths of the ultra-violet exert a much more powerful chemical action than the longer ultra-violet and visible radiations. It appears essential that artificial light tests and natural sun tests should in every instance include a quantity of these very short rays at least comparable to those found in the most extreme condition of sunlight to which the dye or pigment is to be subjected.

All the electric arcs which are used as substitutes for the sun in light tests produce short ultra-violet rays not present in sunlight under any conditions. It seems to be frequently the custom to employ between the test specimens and the arc a glass globe or plate of window glass in order to exclude these short rays. Such a procedure also excludes the shortest and most chemically effective rays of the sunlight, and robs the test of much of its value. It would appear to be far more reasonable to include these short rays from the arc, for if a material can withstand their action, it most certainly will be unaffected by the ultra-violet of sunlight. As might be expected, a substance which deteriorates through the action of light from a bare arc, may still be satisfactory in sunlight.

There exists no artificial arc source of light which resembles sunlight; they all produce shorter ultra-violet than found in sunlight, and, with the exception of the quartz mercury arc, exceed the sun in the quantity of heat rays (infra red) radiated. Incandescent lamps are not suitable for fading tests because, while they produce a small amount of ultra-violet rays, the quantity is too insignificant to be effective. Incandescent lamps may serve as an indication of the stability of a substance to visible and infra red radiations.

As previously stated, the arc source, the best means available for producing intense light even though they do not resemble sunlight, may be employed to determine light fastness, for certainly any substance that can withstand the action of their rays, should not be affected in any manner by the sun.

The use of artificially produced light raises the problem of exposure time and conditions. It is customary to interpret the results obtained with such sources in terms of sunshine hours, but little thought appears to have been devoted to the meaning of this term. Terms like May sunshine and June sunshine are very ambiguous, for May sunshine in New York City is not the same as May sunshine in Washington, D. C. It appears necessary to establish a standard sunshine hour. The standard sunshine hour may be defined as an hour of the average sunshine which the substance is to experience in practical use and may be determined from a consideration of the energy at each wavelength for a day of the year which has average sunshine, and a locality located in the average sunlight zone of the country where the tested material is to be used, and with an atmosphere reasonably free from dust and smoke. Once these measurements have been accurately made, and the sunshine standard established, tests made with artificial sources will have a standard to which they may be referred. It may be possible to state then that an hour irradiation with a certain arc lamp gives results equivalent to those which would be obtained with so many hours of standard sunshine; for with the energy distribution of both the light source and the standard sunshine known, the only variable becomes the specimens themselves.

It is believed that the establishment of such a sunshine standard would be valuable assistance to those interested in fading tests, and would enable results obtained by the use of an intense and dependable light source such as the quartz mercury arc to be properly interpreted.

Discussion of Fading Action

Mr. Friedman—I should like to ask what part humidity plays in the fading of colors.

Dr. Anderson—That is a question you had better ask someone else. As I say, my actual experience in testing fading of colors has been very limited. The humidity undoubtedly plays a part because the fading of colors in the last analysis is a question of photo-chemistry.

Mr. Friedman—What effect has heat with light?

Dr. Anderson—Fading undoubtedly has a temperature co-efficient so heat and humidity play a part. Everything affects it, of course; to what extent it is hard to determine.

W. D. Appel—I should like to tell Dr. Anderson—I understand that he has to leave early—that we have selected a type of sun exposure which can be reasonably well duplicated over a considerable portion of the year, and we have compared the fading in that exposure with various artificial light sources and also with different

sorts of practical daylight exposures so that I think we are making some progress along that. That is my subject, so I don't want to talk of it now.

Dr. Anderson—I hope you will let me have a copy of it, if you can.

President Knowland—It will be published. Are there any further questions? If there are no further questions we will go to our next paper. I am quite sure we thank Dr. Anderson for coming here to-night and talking to us, and it is unfortunate that he has to hurry away, but we shall have to excuse him. (Applause.)

Our next speaker, whom you all know, hardly needs an introduction, Mr. W. D. Appel, of the Bureau of Standards, Washington, D. C., who is to speak on "Progress in the Standardization of Tests for Fastness to Light." Mr. Appel! (Applause.)

. . . Mr. Appel presented his prepared paper, which follows:

Progress in the Standardization of Tests for Fastness to Light

By Wm. D. Appel

United States Bureau of Standards

During the past four years the standardization of tests for fastness to light of colored textiles has received much serious attention in this country and abroad. The Research Committee of this Association, through its Sub-Committee on Light Fastness, of which William H. Cady is chairman, has led in the work here. The British Research Association for the Woolen and Worsted Industries and the Fastness Commission of the German Chemical Society have been most active abroad. My purpose this evening is not to review all of this work but simply to give you a picture of the problem as it is outlined by what your own Association is doing and to indicate the progress being made and the proposed practical solution of the problem.

Daylight Exposures

First I should like to discuss daylight exposure tests. When a series of dyeings is exposed to sunlight the dyeings fade more or less, relative to one another, depending on their nature and the conditions of exposure. Rather surprising results may be obtained. Several years ago Gordon found that samples exposed to Arizona sunlight faded only ½ to 1/10th as much as similar exposures to New Jersey sunlight. I don't think that was Dr. Anderson's implication when he spoke of the Arizona sunlight. More recently Barker and Hirst compared sets of dyeings exposed in England and in South India. *Less* fading occurred in the tropics than in England. A set of dyeings exposed to the famous California sunlight for your committee required sixty sun hours to fade to the same extent as another set exposed at Fall River, Mass., for forty-eight sun hours.

It is not necessary, however, to go to the tropics or to Arizona to obtain results of this kind. Identical sets of dyeings exposed on a roof at the Bureau of Standards in Washington, one facing north and the other south for eleven days and nights last summer faded as follows: Nine samples out of twenty tested faded to the same extent in the north window as in the south, three faded slightly more facing south, six materially more facing south, and two slightly more facing *north*. Although those two dyeings received *less* light facing north they faded a little more than they did facing south. The rate of fading of the dyeings was obviously dependent on the nature of the dyeings and environmental conditions, as well as on the amount of light. This has been checked further with the aid of a barium photo-electric cell for recording the light, but I will not go into that now. Neither will I take time to describe in detail a whole series of tests that were run by your committee to show the influence of glass cover or no glass cover over the dyeings, of free access of air or lack of it, of the angle of exposure, the difference in fading action between sunny sky and cloudy sky, north light and south, continuous exposure day and night regardless of the weather and exposure to sun and clear sky only. But I should like to point out that all of these conditions have an influence on the relative fading of dyeings in a series and therefore on the relative merits of the individual dyeings for practical use.

Here are some samples which show that these differences in behavior are real and important. The first member of each pair was exposed at an angle of 45 degrees facing south on clear, sunny days between nine o'clock and three o'clock, each one for four periods of time. These are some of our very long exposures, the time being 96, 192, 384 and 768 sun hours. The companion on the left is a piece of the same dyeing exposed in a vertical position facing north continuously for the following periods of time: 66 days, 162 days, 265 days, and 479 days. Please notice that some of the vertical north exposures have faded very much more than the corresponding sun exposures but that other north exposures have faded very much less than the sun exposures. Decidedly different behavior in the relative fading of the dyeings is thus clearly shown. We can show many examples of that kind.

Now, I will put a few statistics on the board. These are preliminary statistics on the very important report that you have been waiting for now for about two years, including the fading behavior of over a thousand dyeings. We made these sun exposures, called Set A in the table, as I say, at an angle of 45 degrees facing south

	No. of Samples	Conditions	Comparison with Set A exposed on clear days between 9 a.m. and 3 p.m. at an angle of 45° facing south under glass: Less Faded	Slightly Less	Equal Fading	Slightly More Faded	More Faded
Set B	1179	Like Set A but no glass	1.4	6.9	71.5	16.2	3.9
Set D	1179	Vertical south continuous	10.1	21.6	46.2	7.6	14.4
Set E	1179	45° south continuous	2.2	18.7	64.7	7.9	6.4
Set F	1006	Vertical north continuous	33.0	20.5	29.6	4.1	12.8
Set G and H..	1177	Fade-Ometer	7.8	7.9	63.1	10.5	10.7
Set K	941	Like Set A but another year	0.3	4.0	95.6	0.1	0.0

between 9 and 3 o'clock when the sun was shining, under glass, but with the samples away from the glass so the air could get in.

The first line across the table shows that a duplicate set of the dyeings, the Set B samples, 1,179 in number, which were exposed simultaneously with Set A but without the glass cover, faded as follows: One and four-tenths per cent of the samples were less faded in Set B than in Set A in spite of the fact that they received more light. Further, it shows that 6.9% faded slightly less, 71.5% faded to the same extent, 16.2% faded slightly more, and 3.9% faded decidedly more in Set B than in Set A.

Similarly, other sets of the dyeings, D, E, F, G and H, and K in the tables exposed under different conditions gave other results as indicated. You will notice, for example, that in Set F the continuous exposure facing north 33% of the samples faded entirely too much compared to Set A fading, while *at the same time* 12.8% of the samples faded entirely too little. There is much better agreement than this between the Set A sun exposures and the Sets G and H "Fade-Ometer" exposures and there is excellent agreement between the original Set A exposures and the duplicate exposures Set K made in the same way but the following year.

Now the point of all this is that individual dyeings behave differently under different conditions of ordinary daylight exposure, and before a laboratory accelerated fading test of any practical value can be established the type of daylight exposure which it is hoped to reproduce in the test must be selected.

Your committee has found one type of daylight exposure which will give fairly reproducible results over the better part of the year and in different parts of this country; namely, exposure between 9 a.m. and 3 p.m. on clear days, samples to be placed at an angle of 45° with the horizontal, facing south, and protected by window glass ⅛-inch thick, the glass to be raised ½-inch above the samples and provision made for free access of air. This has been selected by your committee as its "standard" sun exposure test and recommended for general use wherever a definite reproducible daylight test, having minimum environmental complications and maximum light effect, is required, something to use as a control on the laboratory test and in cases of dispute, though perhaps for routine testing.

Factors Which Influence Results of Exposures

Before speaking of accelerated tests, it may be worth while to mention some factors which are responsible for the variable behavior in daylight exposures.

1. *Atmospheric humidity* has long been recognized to be an important factor. Controlled laboratory experiments show that some dyeings fade three times faster in air of high humidity than in low. The fact that New Jersey was more humid than Arizona and England more than India during the tests previously mentioned has been suggested as accounting in part for the results obtained. Similarly the north continuous exposure condition, Set F in the table, is one of higher atmospheric humidity than, say, the sun exposure Set A.

2. *Other atmospheric influences* have been noted such as those of acid or alkaline vapors.

3. *Temperature* may have an effect but probably it is not a large one and evidence is lacking.

4. *The spectral distribution of the radiation* obviously is important because only radiation which is absorbed can produce fading and dyeings show selective absorption, i. e., one dyeing absorbs in one part of the spectrum, another in another part. Your committee has obtained some information on this phase of the subject by exposing a series of dyeings under glasses having suitable spectral transmissions. I should like to go into this in a little more detail because of its bearing on artificial light tests and on prevalent ideas about the ultra-violet radiation in sunlight.

I will put some curves on the board. Dr. Anderson went over this part of the subject very nicely, and you remember he said that the limit of the solar spectrum was about wavelength 295. Here is 300, and here is 400 to the left of which is the ultra-violet. Over here 500,

600, 700, all in the visible spectrum and over here beyond 700 is the infra red. Maybe I had better put another cipher on these wavelength figures and make them Angstrom units.

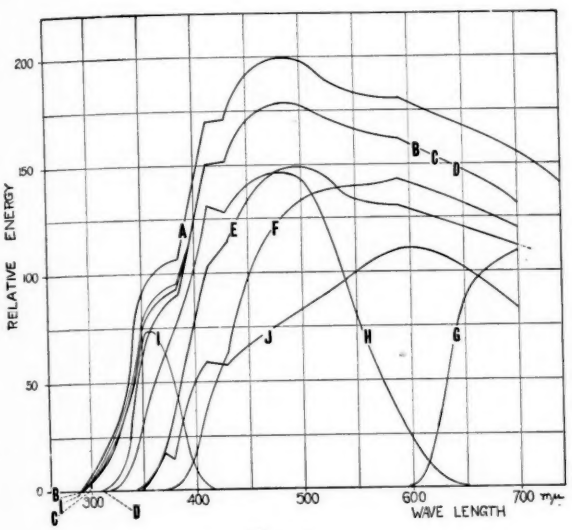

FIG. 4

Energy Distribution in the Radiation Reaching the Samples Exposed Under the Glasses. The Letters Refer to the Glasses Used.

In the second report of the committee we have tried to derive an average curve for sunlight at the level of our samples, that is, sunlight at the earth's surface, and it is something of this order: starting at 2950 here, it curves up steeply here and it falls down gradually on that side.

Now this part of the ultra-violet in sunlight down here between about 3100 and 2900 is extremely variable. As Dr. Anderson said, often it is missing entirely.

We ran experiments with glass which transmits out farther, farther than this, so we got all the ultra-violet we could from the sunlight (curve B in figure). Window glass transmits about here (curve D). That is the radiation that gets through the glass to the dyeings. Vita glass transmits a little more ultra-violet (curve C). It comes down in here somewhere like that.

Here are some of the results. Perhaps I should tell you of the whole series of glasses. I have labeled here Corex, and Vita, and window glass, and then we had a glass cutting off like this and another one right here at the edge of the visible spectrum, and another glass over here that lets in only the red end of the spectrum.

Let's see how these dyeings faded. They were exposed simultaneously under the different glasses. This is the window glass exposure. Here is the red glass exposure. The dyeing is not faded in the red light, not at all. It is faded considerably under window glass. Here is Vita and Corex. You see there is no more fading there than under window glass.

This Noviol glass cuts out all of the ultra-violet part of the spectrum, but this particular dyeing is faded as much there as over here. This dyeing is faded by the visible radiation in the sunlight and the ultra-violet isn't doing anything to it.

Here is no glass cover at all. Here it is no more faded than the others, and this is one of the samples which faded a little *less* without glass cover over it than with the glass cover over it. Don't ask me why. (Laughter.) All I could tell you is that the dyeings exposed under glass in this cabinet are at a higher temperature and that means lower humidity. Those two things must be responsible. I don't know of anything else. That is an exceptional dyeing, of course.

Now here is a green. Look at this. It is not faded by visible radiation. It faded a little under window glass and quite a little more under Vita glass, but the only thing gained by using Vita glass is this little bit of radiation here, so in this particular case it is this short wavelength ultra-violet, out here, that is doing most of the fading, although there is a little fading under window glass. The exposure without glass is but little more faded. We have a black glass over here, practically opaque to look at, letting through only ultra-violet and this dyeing faded under it. That is entirely different behavior from the previously mentioned dyeing.

Here is your old friend Methylene Blue on silk. (Laughter.) It fades in visible radiation. It fades a little under the red glass. It fades under black glass letting through only the ultra-violet. Obviously it is fading from the radiation in several parts of the spectrum. You notice that it is fading about as much under window glass as under the special glasses or under no glass at all.

Now here is a yellow dyeing. I didn't bring the whole series. They are in this report that came out in June. I don't suppose you have read it. I don't think people ever do read reports. (Laughter.)

Mr. Friedman—This one of yours will be read.

Mr. Appel—Thank you!

Yellow is absorbing the blue and violet light. It reflects the red, and the yellow and orange, and begins to absorb in the green and it takes out the violet end of the spectrum. It is not fading under red light here. It is fading, you can barely see it, in the visible light. These samples are faded not much different under window glass from these others under Corex or Vita glass.

I will show you another case. This is Mr. Cady's old friend, Indigo on cotton, which fades about the same under the whole series of glasses. I am sorry I didn't expose one with a piece of sheet tin over it raised, so the

air could get at it. (Laughter.) These have all faded to just about the same extent regardless of the sort of radiation that fell on them.

Here is another blue. This is Alizarine Blue on wool. Here is a dyeing that is fading a little more under the special glasses than under window glass, but we chose that series of twenty dyeings out of the big series of over a thousand dyeings and they are the extreme cases.

The importance of the ultra-violet radiation which passes through window glass as well as the blue and violet regions of the visible spectrum is clearly demonstrated in the tests made by your committee, and it is true that some dyeings are particularly sensitive to that part of the solar radiation which is absorbed by window glass. The deficiency of solar radiation in this last-mentioned region, well shown in the curve, should be borne in mind. Not only is it very small in amount but it is extremely variable and at times entirely lacking, as Dr. Anderson told you. We feel that should be borne in mind. The effectiveness of this region for fading should not be exaggerated and should not be confused with its bactericidal and therapeutic importance, which has been very much stressed recently. We couldn't see the necessity for using a special glass like Vita for exposure tests as the British have done.

Accelerated Fading Tests

The intensity of the radiation as well as its spectral distribution is an important factor. Gebhardt observed in 1914 that light of a given spectral distribution must have a definite intensity before it can cause fading and that this "threshold" value is specific for each dye. These dyeings on the left, for example, have been exposed to light of low intensity and on the right to light of high intensity, and you will observe how the samples in the upper row have faded on one side only, the lower row on both sides.

If your drapery hangs in a dimly lit room or a north window, it may not fade even though it would fade in an ordinary sun test.

I should like to emphasize at this point, 1. The fading of dyeings in *use* is influenced by a number of independent variable factors. 2. Individual dyeings behave differently with respect to these factors. 3. Incidentally, the ultra-violet in sunlight which is not transmitted by window glass plays a relatively small part in dye fading in everyday conditions.

I will take but a few moments to discuss accelerated fading tests. Although the final criterion of the fastness to light of a dyed fabric is the daylight exposure test, the need for an accelerated test is apparent. The quartz mercury light, "the light that fades," without a doubt produces entirely different fading from sunlight, though if the dyeings are protected from the short wavelength ultra-violet not present in sunlight, results are obtained which are rather remarkable in view of the discontinuity of the radiation.

The 1,000-watt gas-filled Mazda lamp has given encouraging results as a source of light, but in order to get the necessary intensity at the violet end of the spectrum much larger lamps would be required. This greatly increases the cost and the difficulty of removing the excessive heat radiation. For the present the idea seems to be impracticable.

The point-light, tungsten arc similarly does not appear to be a practicable source in its present development.

The enclosed carbon arc lamp is perhaps the most useful source now available, and it is used rather extensively in the dye and textile industry. It gives results which agree reasonably well with sun exposure, though some samples fade too much and others too little when exposed to this source in the usual way. The British Research Association for the Woolen and Worsted Industries has devised an outfit using this light in which a lower temperature and higher humidity at the samples are maintained, and this gives somewhat better results. The possibilities for improving the carbon arc lamp for this purpose have not been exhausted.

Proposed Standardization Plan

I now come to the solution of the problem of standardizing tests for fastness to light which is already being put into effect by your Research Committee. It is evident, I think, that no one standard light and set of exposure conditions will tell the whole story of how dyeings will behave in use. Some people will be satisfied with the results of carbon arc tests, others with those of the standard sun exposure test, while still others will be satisfied only with continuous daylight exposure tests even though they may not be capable of duplication. One way to overcome this difficulty would be to test under two conditions or else to work out a cycle of conditions such as that used by progressive paint-testing laboratories. This is a matter for future development.

For the present, at least, the practical solution of the problem appears to lie in the adoption of a set of standards of fastness with which everyone can compare his samples. This Association has undertaken to prepare and distribute at a nominal fee sets of dyeings representing the different recognized degrees of fastness to light. Thus, instead of designating dyestuffs to be dyed by the tester—the practice of the German and British associations—pieces of cloth of

known fastness will be used as standards, and anyone may test against the same identical standards and express fastness in terms of them. Tests may be made in daylight or suitable artificial light, but prevailing conditions should, of course, be recorded and the limitations of any single test borne in mind in interpreting the results.

Discussion of Light Fastness Standardization

President Knowland—Are there any questions anyone would like to ask Mr. Appel?

Mr. Sturtevant—I should like to ask if he considers the difference between results obtained with carbon arc light, such as the Fade-Ometer with humidification through the use of wicks, and so forth, sufficient to necessitate the use of wicks and fans for air circulation in commercial fading.

Mr. Appel—There is no question but what you get slightly improved results. We haven't tests on a sufficient variety of materials to be sure of the extent of improvement. Some of our dyeings were exposed in the Fugitometer, some in the Fade-Ometer with the humidifying arrangement, and the fan on top for drawing the air up around the wicks, and the results are a little better. They are not quite good enough yet to say that they agree with daylight exposures.

Mr. Sturtevant—The Fade-Ometer has been used with wicks to draw all the air over the wicks and also it has been used with wicks without a covering on the outside.

Mr. Appel—We haven't run any number of tests that way.

Mr. Friedman—What attention was given to the Fade-Ometer when the tests were carried out? What attention was given to the glass globe surrounding the carbon arc?

Mr. Appel—In our tests they were cleaned thoroughly once every twenty-four hours.

Mr. Schmuntz—The Fade-Ometer was used. Did you use the new impregnated therapeutic arc?

Mr. Appel—We could have a very much better light source so far as the duplication of the spectrum of sunlight by using special carbons, but the use of those carbons prevents the use of a glass globe around the arc and the carbons have a very short life relatively; for testing purposes you must have a lamp that will run twenty-four hours or at least overnight, and I think the impregnated carbons will run only two or three hours at the most. That is not practicable for testing purposes.

Mr. Schmuntz—In the paint testing field we have tried the use of the impregnated, using a closed circulating system and got as much as sixteen hours. It seems very promising, particularly from the question of darkening of paints. The whole thing is quite cumbersome to handle.

Humidity and Fastness

Mr. Appel—Don't your glass globes become coated?

Mr. Schmuntz—You have to have a circulating system to carry off the fumes as they are generated.

Mr. Appel—Carrying them up?

Mr. Schmuntz—Yes. With regard to humidity, it plays an important part if you approach almost saturated conditions and with ordinary wicks we have had no success. We have tried a little stunt to increase humidity by tying the wick on to an ordinary electric light bulb which vaporizes the water, and we have increased the humidity and in the fading of paints we find the fading is increased tremendously if you approach saturated conditions.

With regard to the standard light test, I should like to know have you specified the time of year that these tests should be carried on?

Mr. Appel—No, we haven't. What we did do was to expose a series of twenty dyeings in four seasons and at different places, in Canada, in Georgia, in California, and so forth, and while the time required to fade a set to a given extent was different in the different cases, the relative fading in the series, which is the thing that worries us most, was pretty much the same, certainly over the summer months. The winter months showed it to be a little different, but not much.

Mr. Schmuntz—The test glass referred to is ordinary window glass, is it not?

Mr. Appel—Yes. Don't you spray your paints with water to simulate rain?

Mr. Schmuntz—We are referring to exposure under lights, under high humidity conditions.

Mr. Appel—In the case of dyeings there has been quite a bit of work done on humidity. Back in 1902 Brownlie thought that fading was proportional to atmospheric humidity or something of that kind, and the more recent work done in England led to a somewhat more complicated mathematical relation between moisture and rate of color change. This work was for a few samples only. It is a pretty complicated situation when you consider a wide assortment of dyeings. Some of the dyeings get darker instead of lighter, and some get darker and change their mind and begin to get lighter again (laughter), and when you begin to measure color changes, it is a three-dimensional proposition and it gets pretty complicated. We have dyeings which in the sun test get lighter and lighter, and when we expose them north they may not fade or they may get darker at first.

Mr. Friedman—Mr. Appel, what opinion would you express with regard to the use of a sleeve made of wick

material, same type as the Fade-Ometer people are using now, a sleeve made of this surrounding the globe at a certain distance away from it so as to increase the humidity of the Fade-Ometer?

Mr. Appel—You mean with water running down over it?

Mr. Friedman—No, upward, having the bottom of the sleeve in the pan. I haven't tried it yet.

Mr. Appel—There is such an enormous amount of heat thrown there that I should think you would have to clean the wicks very frequently.

Mr. Friedman—With the fan now being used with the Fade-Ometer, I believe the temperature is brought down from 90° Cent. to 42 or 44° in the Fade-Ometer, so I think it might help a bit.

Mr. Appel—I should think it would help materially.

Mr. Moran—It would be simpler to put in a regular humidifying arrangement.

Mr. Appel—As the air comes in around the Fade-Ometer arc it heats up. It jumps up 20 to 30°, and the humidity goes down correspondingly. The trouble is in getting the right humidity at the sample, and that depends on the temperature at the sample.

I should like to ask what you think of the idea of the standard samples, if you have any thoughts on the subject. If you think they wouldn't work, I should like to know about it, and why.

Fading in Storage

Mr. Zisman—This probably has to do more with the properties of certain dyestuffs, but I have noticed in some instances where a sample dyed up—I don't know with what particular color or combination of colors—and put into an enclosed container of ours for a number of months or perhaps weeks, will have a definite fading action in a place where there is no particular heat nor anything but just normal storage. It is put into a container, a paper box. Now what would you attribute that to, merely to the color property or is there some other factor there to be considered?

Mr. Appel—I don't know, a lot of lithographic ink prints were exposed along with these dyed samples, and some of those that we had changed color in the unexposed area and regained their color on exposure to light, because of the fact that the varnish turned yellow in the dark and was bleached in the light. Some blues turned green when covered up from light, but they would come back.

Mr. Zisman—This particular sample didn't come back on exposure to light. I think it was possibly due to a reaction of the particular dye in question.

Mr. Appel—The temperature wasn't high?

Mr. Zisman—No, it was normal.

Mr. Appel—I once put some dyeings in a mason jar and put them in an oven and raised it to a temperature no higher than that obtained in the sun exposures on the roof, and there was a change in the color there, but nothing very marked.

Chairman Knowland—It may have been due, Mr. Zisman, more to storing than actual sunlight. That frequently occurs with a lot of dyes when packed in boxes or wrapped in paper, stored on shelves in a store.

Mr. Friedman—We have had experience with some merchandise stored away over a considerable length of time, and our investigation has shown that the presence of sulphite in the paper will cause the fading. At other times the use of camphor will cause the fading.

Mr. Zisman—I see the point there, all right.

President Knowland—I wonder if Professor Olney would like to say a few words?

Professor Olney on the Work of the Research Committee

Professor Olney—I am pleased to have this opportunity to say a few words concerning the work of the Research Committee and the way in which the individual members can support that work and also perhaps help the committee with suggestions. We have the feeling that perhaps the members of the Association at large think that the Research Committee does not broaden out sufficiently and extend their work into lines that may be of more definite interest to them. On our questionnaires we have a great many times called for suggestions as to what you as individual members believed that we might do to increase the interest of the work of the Committee and make it of more general value, but the returns from these questionnaires have been meager and of but little help.

The Research Committee would be very glad to have suggestions from each and every member of the Association as to what they believe we can do that will be of greatest interest and greatest value to them Of course, you understand that it would take considerable money to conduct extended research work, and we all live in hopes that that is coming some time not too far away; but meanwhile there might be a number of comparatively simple problems of standardization, or perhaps study of methods which are extensively used in textile testing laboratories that could be worked out in a comparatively short time, and if you will only bring those things to our attention, we surely will be glad to consider them.

We are open to suggestions at all times. And I might state also that the impression exists on the part of some members that the Research Committee is very slow in drawing conclusions and publishing standard methods.

The reason for this apparent delay is that our members are scientists and technical men. They are conservative and they do not intend to put anything out as coming from the Research Committee that cannot be vouched for. We therefore believe that when our reports are published you will find that, while they may be here and there open to some criticism, perhaps for things we have overlooked, they are nevertheless the result of long continued experimental work and thoughtfulness upon our part. Those of you who have examined the reports of the Sub-Committee on Light Fastness—of which Parts 1 and 2 have already been published, and I believe Part 3 is to come along within a month—will find that this work has been very exacting and exhaustive and I believe it may be depended upon entirely. Please send us your suggestions. (Applause.)

Relative Fastness

Mr. Appel—Mr. Christison has just told me that perhaps I have left the wrong impression with you about the north light exposures. I don't want to leave the impression that the dyeings we have tested, with very few exceptions, have faded as fast or faster in the vertical north position than in direct sunlight. That is not true. It has taken two or three times, or even longer, in the north position to produce the same amount of fading as in the direct sunlight.

The point I was making was this: Take two dyeings which fade to the same extent in sunlight, put them in a vertical north position and one may not fade at all while the other is fading very badly. It is relative fadings between different dyeings.

I emphasize that because what we are really talking about is relative fastness rather than absolute fastness. You pick a standard and say everything as fast as this will be satisfactory. If you test it in a sun test, you may get a different result from what you would get in use in a north window. That is the only point I am trying to make. I don't want to give the idea that we are finding that they are all fading more north than when put out in bright sunlight.

Mr. Friedman—I should like to ask whether our Association has done anything with regard to the testing of materials for resistance to water. By that I mean rainproof, or showerproof, or anything like that, whether any standards can be evolved.

President Knowland—That would come under the head of the Research Committee.

Professor Olney—The Research Committee has done nothing along that line.

Mr. Friedman—I am perfectly willing to volunteer my services and the services of our laboratory in assisting your Committee in working out any such test. We happen to be doing something in that now, and conducting a number of tests of material, and we will be perfectly glad to offer whatever service our modest little place will give you.

Professor Olney—That will be appreciated very much. It is just the sort of thing we are looking for. I am glad my talk brought that out.

. . . The members gave a rising vote of thanks to the speakers of the evening. The meeting adjourned at ten o'clock.

Applicants for Membership

Active Membership

Beane, A. T., overseer of dyeing, Judson Mills, Greenville, S. C. Sponsors: D. S. Moss and T. J. Nuckolls.

Bishop, Oakley M., dyestuff division, E. I. du Pont de Nemours & Co., Wilmington, Del. Sponsors: E. J. Monaghan and E. H. Gamble.

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EIGHTH ANNUAL MEETING

American Association of Textile Chemists and Colorists

At

PROVIDENCE, R. I.

Providence-Biltmore Hotel

On

FRIDAY, DEC. 7 and SATURDAY, DEC. 8

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The Program (Subject to Some Revision)

Friday, December 7

3.00 P.M. Joint meeting of Council and Research Committee.

7.30 P.M. *Open Forum and Technical Papers.*

New Method for Bleaching and Mercerizing Cotton Piece Goods Containing Vat and Sulphur Colors by Use of Kieropon—A. R. Thompson, Rohm & Haas Company.

Solvents in Soap—R. W. Gaeger, Armour Soap Works.

Entertainment.

Treatment of Wool with Active Chlorine in an Organic Carrier—G. L. Armour, American Aniline Products, Inc.

Entertainment.

Cellulose and Its Importance to Textile Industry—Dr. John E. Jackson.

Entertainment.

Other subjects can be introduced for discussion by any member as time permits.

Saturday, December 8

Morning Session

9.45 A. M. Dehydrating and Drying in Same Manufacturing Process—M. L. Griffin, Technical Chemical Engineer.

10.10 A.M. The Bleaching of Textiles with Hydrogen Peroxide.—H. G. Smolens, Buffalo Electro Chemical Company, Inc.

10.30 A.M. Cross Sectioning of Textiles—Arthur K. Johnson, Cheney Bros.

10.45 A.M. Manufacture of Rubberized Cloth and Attendant Dyed Cloth Problems—S. G. Byam, Du Pont Company, Fairfield, Conn.

11.10 A.M. Application of Indigosols in Printing—W. H. Cotton, General Dyestuff Corp.

11.30 A.M. Business Meeting of Association.

1. Election of Officers—Report of tellers.
2. Action of proposed Amendment.
3. Reports of Treasurer, Secretary Committees (Prize Awards, Research Committee and Technical Committee), Launder-Ometer—Appel and Christison.

Afternoon Session

2.00 P.M. Potash or Soda Soaps—Which?—W. N. Bray, Procter & Gamble.

2.30 P.M. The Problems of Testing Textile Merchandise for the Retail Merchant—Frank Stutz, Better Fabrics Testing Bureau.

3.00 P.M. Shrinkage of Cotton Cloth—H. D. Clayton, Cluett, Peabody & Co., Inc.

3.20 P.M. Problems in Dyeing Sulphur Blues—Walter F. Haskell, Dana Warp Mills.

3.40 P.M. Color Science Applied to Textiles—Dr. W. M. Scott, Munsell Color Company, Inc.

4.05 P.M. A Study of pH of the Vat Dye Bath—Prof. Chas. E. Mullin, Clemson College.

4.30 P.M. Some Dyeing and Dyers of the South (Illustrated)—Prof. Albert H. Grimshaw, North Carolina State College.

The Annual Banquet (Saturday Evening)

Several unusual features of entertainment have been arranged by a special committee of the Rhode Island Section of which Ralph F. Culver is Chairman.

P. J. Wood will preside as Toastmaster at the banquet.

At the Open Forum, Friday evening, a magician, Friskella, will entertain between discussions.

The Mayor of Providence will make the Address of Welcome at the banquet.

Malcolm MacGregor, the eminent chemist of Edinborough, and Geoffrey O'Hara, humorous songwriter and speaker, will, each in his own way, present something unique in the way of entertainment. Other special features and a surprise or two are being planned.

Music will be provided for the banquet by the Moonlight Serenaders, instrumental singing quartette, and Miss Selma LaRochelle, soloist.

AMERICAN
DYESTUFF REPORTER

Devoted to the use and application of dyestuffs and the mechanical equipment incidental thereto.

LOUIS A. OLNEY
PROFESSOR OF CHEMISTRY AND DYEING, LOWELL TEXTILE SCHOOL
Directing Editor

CLAYTON HOAGLAND
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NEWS THAT MUST BE RIGHT

ABRAHAM LINCOLN'S oft-quoted motto, "Be sure you're right, then go ahead," applies nowhere with greater force than in the newspaper profession. It is emphasized among the first principles in which aspiring journalists are schooled. And in the main it is scrupulously followed by every newspaper man who is guided in his work by the ideal of truth and is conscious of the trust that is placed in him by his profession.

Nor is it the easiest thing in the world to be sure you are right before going ahead, to be sure of your facts before writing your story. In the swarming life of a great city where events succeed each other with the speed of a clock's second hand, where a public clamors for news of the latest while that news is still warm, great in proportion to these handicaps is the paper that is right most of the time.

But the conditions are different whenever the journalist is reporting facts not urgently needed for news columns. When a scientist makes an epochal discovery, when an engineer propounds a new technical principle, or when a chemist announces the result of a painstaking research, then there should be time for the newspaper man to be right before going ahead with the story, for the world will wait long enough to get the facts.

A daily trade paper in New York recently printed a brief news article about the Launder-Ometer, the machine for washing tests devised by members of the Research Committee of the American Association of Textile Chemists and Colorists, in which careless assertions were made that missed the truth by several inches—or yards; it matters little, because in news of this kind a miss is as good as a mile. It was stated by this paper, for example, that the machine was used for *shrinkage* tests; no mention was made of washing, and credit for its invention was also misplaced.

This particular story, in which facts were unintentionally twisted, was not important enough to cause any person or any organization serious trouble. But the point is, it might have been. Anyway, the misstatements would not have occurred if the reporter had made sure of his facts and used only the facts he was sure of. Instead, a grain of truth was rolled up in a blanket of guess and conjecture. It was only assumed that the machine was built for such and such a purpose, and certain men alluded to in connection with its demonstration were evidently "supposed" by the reporter to be those who designed it.

A few mixed facts can be excused in the last-minute story of a railroad accident, but when a piece of technical apparatus is described there is no reason why the right facts cannot be determined before the story gets into print. Science, from one aspect, is a search for truth; in reporting scientific or technical news, the papers also would do well to be guided by that finest of all ideals, and take the time to be right.

MORE THAN A QUESTION OF NAMES

BY forming new buying habits for the public, that modern science called advertising has raised the selling power of the trade-mark. Cough-drops and canned fruit and radios, hosiery and rayon have become brand names in the minds of consumers. As one good effect of trade-mark selling, a higher premium has been put upon quality; for branded goods can be compared with one another and the superior product remembered by its mark. On the other hand, trade names and brands can often mislead or deceive, and to establish a good name for one's goods there should be no confusion about them in the buyer's mind. The name of the brand should never become of greater importance to the manufacturer than the *character* of the product that brand symbolizes. Good advertising, in other words, can push a certain brand to the front, but only quality can keep it there, year in and year out. This is a truism of selling that needs no elaboration here.

In New York we have a group of business men whose chief concern it is to improve business by removing all questionable tactics from selling and to clear away all deception and confusion over products sold, in the interests of the public. Thus it came to pass that in pursuing its vigilant way the Better Business Bureau of New York City recently discovered in the rayon trade a condition which seems to create confusion and call for remedy: too many misleading terms are being used to describe rayon fabrics and apparel.

This Better Business Bureau issued a bulletin, consequently, in which certain important facts about rayon were explained. The bulletin pointed out that rayon has been defined by the Bureau of Standards as:

> The generic name of filaments made from various solutions of modified cellulose by pressing or drawing the cellulose solution through an orifice and solidifying it in the form of a filament, or filaments, by means of some precipitating medium.

This definition and the use of the term "rayon" have been approved and adopted by such bodies as Committee D-13 on Textiles of the American Society for Testing Materials, the Federal Trade Commission and others.

The practice frowned upon most sternly by the Better Business Bureau is the use of misleading descriptive terms in advertising rayon products, such terms as "rayon silk" or "transparent velvet" for goods in which rayon is the basic fiber. It frowns also upon the use of brand names like Bemberg, Tubize or Celanese without the qualifying term "rayon." The Celanese Corporation, which has consistently maintained that its product is not rayon, naturally took issue with the Business Bureau on the latter point and a controversy ensued.

The increasing consumption of rayon in this country has created more problems than the one of selling by brand name, and problems far more important to the rayon industry. Let it be granted that the term "artificial silk" has long been obsolete and that such careless phrases as "art silk" or "rayon silk" or "Celanese silk" are undoubtedly misleading, no matter who may use them. What could be more to the point than the opinion of the Better Business Bureau, as expressed in its bulletin, that "rayon can stand on its own feet without trading upon the good qualities and established reputation of any other fiber"?

However, the question most interesting to rayon manufacturers, to mills that use rayon in large quantities and to distributors of rayon fabrics is, How *can* rayon be made to stand on its feet more securely? For we cannot deny that a strange prejudice exists against this chemical fiber in the minds of many, many persons to-day. No one knows certainly how many women shoppers there are who will not buy any apparel containing rayon.

Outstanding among the problems of the rayon and the textile manufacturers, therefore, is the great problem of reducing this public prejudice against rayon to the minimum. This can be done only by making rayon apparel that will sell in carloads on its own distinctive merits. There should be no attempt to mislead. The mere fact that rayon is a chemical fiber should not deter the average shopper from buying it. What the public demands is a textile that is both attractive and serviceable, regardless of its physical or chemical nature. Where is the woman who thinks in terms of fiber structure when she buys a yard of taffeta?

Now most fabrics made wholly or largely of rayon are sold in the form of garments dyed and finished. In view of this, no more profitable move could be made by the textile and the rayon industries than an earnest effort to co-operate very closely in studying essential factors like the bleaching and dyeing properties of rayon, its behavior in laundering and dry-cleaning, and its improvement as a textile fiber through better processing methods. To say that co-operation on these points will make rayon more popular may sound somewhat platitudinous; but isn't it true? The trade-mark was invaluable in introducing the different brands on the market, but lasting popularity for rayon can be achieved only by improvement in its quality. Dyeing ranks as a vitally important element on which co-operation between the rayon plant and the dyehouse is sorely needed.

EXTRACTORIALS

The research laboratory of the industrial association has a stability and continuity which comes from spreading broadly the cost of support. Under these auspices, scientific research does not suffer economic uncertainties and vicissitudes. Association research is a comparatively new development in this country. . . . It calls for interpretative and educational service, for patience and sympathy with many diverse interests and viewpoints, but because the plan is structurally sound, it is destined to grow.—*W. Lee Lewis, in Journal of Chemical Education.*

The real foundation of the business world is neither labor nor capital nor that elusive individual, the Ultimate Consumer. It is science.—*Dr. E. E. Free.*

In its competition with silk, cotton has one tremendous advantage in that it is more adaptable to fast color—in these days when the styling of a fabric is based so often on a very subtle scheme of color harmony one faded color can ruin the whole effect.—*Lincoln Baylies, President of the National Association of Cotton Manufacturers.*

The business man to-day has to run like the devil in order to stay where he is.—*Merle Thorpe, editor of Nation's Business.*

The most difficult thing in the world for some business men to learn is that a fight to the finish generally results in disaster for both belligerents. It is next to impossible to engage in a death struggle and emerge unscathed. . . . The intelligent business man prefers to co-operate. . . . —*Advertisement of the Woolen Corporation of America.*

It is unfortunate that the domestic [chemical] industries can be brought to a full realization of their danger only by a catastrophe that practically destroys them—that it takes a World War to awaken them and that an armistice lulls them to sleep again.—*Textile Colorist.*

A study of the history of industry during the last twenty years produces many instances of concerns which, ceasing to be progressive, have automatically ceased to be monopolistic.—*Manchester Guardian Commercial.*

RECENT LITERATURE

Dry-Cleaning Practice

The Instructor in Garment Cleaning; Volume I. By C. C. Hubbard, National Association of Dyers and Cleaners, Silver Spring, Md.

This is a revised and enlarged edition of a book of the same name published about four years ago. The first edition was designed principally as a textbook for students and as a practical reference. These same features have been continued; but the present volume recognizes the need for a broader field of information and incorporates many new standards and definitions and the result of research work upon fabrics, dyestuffs and detergents. There are also assembled in a more convenient form the information and material published during 1925, 1926 and 1927 in the official organs of the National Association of Dyers and Cleaners.

This book is the outgrowth of twenty years' practical experience of the author and his association, with a number of educational and research institutions, including more recently the U. S. Bureau of Standards and the National Association of Dyers and Cleaners.

The material presented should aid materially in the training of more intelligent workers in the various branches of the garment dyeing and cleaning industry, and provide them with an opportunity to acquire a more thorough knowledge of their trade than has heretofore been possible.

A large number of typical jobs in dry-cleaning, spotting, wet-cleaning, tinting and spot dyeing are discussed in detail as to individual operations involved, as well as to tools and materials used. In most cases these discussions are followed by a series of questions which cover the essential steps and important features of the operation.

There are also included a dictionary of trade terms, a series of formulas for the preparation of various materials used by the trade, tables of weights and measures, methods for testing fabrics, and ink and paint charts, giving their composition and solubilities. L. A. O.

Scientific Matching

Exact Color Matching and Specifying.—By L. Blin Desbleds. Paris: Technological and Industrial Service. 116 pages. 32 illustrations. $1.00.

Because the buyer of dyed goods cannot specify exactly the definite color he requires, argues M. Desbleds in his introduction, and because the dyer cannot guarantee any limits within which he can reproduce the color of a given sample, dyeing is still an art. As such, he says, it has escaped from the precision of scientific measurements. "It is so much open to personal appreciation that the exact color of a dyed job as seen by the dyer may form the subject of endless disagreements."

On this premise, however, it is not accurate to assert that *dyeing* is an art, not a science. What M. Desbleds means to imply, obviously, is that *shade matching* is still an art, to which we and all artistic dyers will breathe an *Amen!* The actual process of dyeing is rapidly becoming a chemical science in which mechanical craftsmanship plays an increasingly important role; but outside the technologist's laboratory where spectroscopes and colorimeters are used, we must still depend upon the human eye as a color matching instrument—and upon this unreliable instrument we shall continue to depend until some more scientific system such as that explained in this volume becomes more generally used.

The book is, in brief, a lucid exposition of the method of precise color matching made possible by Toussaint's photo-electric photo-colorimeter. Its aim is to explain how matching may be reduced to a science as simple as that employed in visual matching, how color may be specified with scientific exactness. It admits that the practical dyer objects to most scientific instruments, first because those proposed for his use have been too complicated and demand special training; and second, because the dyer finds it difficult to reconcile the color theories of the physicist with those of the physiologist. These two viewpoints are briefly explained.

The main sections of the book deal in turn with factors influencing color sensations; colors in nature and in the arts; the color curve and its interpretation; matching curves as compared to eye matching estimation; the color curve as a practical working instrument, color matching to specification. These may sound pretty abstruse in the main, but the system as explained is much simpler than this mere outline would imply. It necessarily requires considerable study, naturally, and on that score will not be attractive to any large majority of dyers. Ten years from now, however, it may be a standard system of color matching.

Wool Processing from All Angles

Cloth Finishing: Woolen and Worsted.—By John Schofield, B.Sc., A.R.C.Sc., and J. Colin Shofield, B.Sc. Huddersfield, Eng.: Netherwood, Dalton & Co. 725 pages; illustrated. $6.50.

To textile men in this country the term "finishing" does not usually include a study of oils, fats, detergents, water and such primary processes as scouring. In case it may be assumed by some readers that the scope of this book is limited to those processes that come under the head of finishing as known in this country, it should be explained at the outset that the Schofields cover very thoroughly and competently the entire processing of wool with the exception of dyeing.

From reviews of this volume published in some of

the outstanding British journals it is evidently accepted by them as the latest word on a subject of great importance to mill managers, finishers, chemists and research workers. This praise is fully justified. Thoroughness has been the by-word of the authors Their digressions from the subject of wool scouring into the chemistry of reagents, oils, fats and detergent action provide supplementary material of real value.

Scouring, milling, drying, cutting and raising are some of the more important phases of wool manufacture dealt with at length. In addition, such technologic aspects as moisture regain, and the chemistry and physics of the wool fiber will be of interest to research chemists. The chapters on scouring and milling are especially praiseworthy in the simplicity of the technical description. The knowledge of wool chemistry is quite up to date and clearly presented, although nothing of a revolutionary character is advanced. It is as a whole a very adequate text-book.

Playing After Work

Outdoor Recreation for Employees. Policyholders' Service Bureau, Metropolitan Life Insurance Company, New York City.

A greater need for organized play for plant employees has been created by the trend toward specialized jobs and the increasing monotony of plant work. Plant owners are therefore encouraging and supporting various programs of recreational activity because they realize that systematic play increases the efficiency of their workers, according to this study of outdoor recreation by the Metropolitan Life Insurance Company.

The booklet discusses the various problems and practices of play activities for workers and covers many phases of the subject. Copies may be obtained free of charge by writing to the insurance company.

Book Chat

In the Industry's Journals

When the promise was made in this column, more than five weeks ago, that future instalments of this more or less rambling discourse on current trade literature would be more interesting than the first attempt, it was not expected that five weeks would slip by before the promise could be kept.

And with the passing weeks no less than two solid feet of rag and wood pulp have been added to the stack of printed matter on the floor beside the Chatter's desk. The strata of pulp on the bottom is yellowed and somewhat ragged around the edges, and is not therefore the logical place to *begin* if this column is to sparkle with the brilliance that attracts. . . .

In short, what is said here must compete for interest with the technical section of this journal, and readers will agree that the competition is terrific. So, then, to the top of the pile. . . .

And right on the top is an editorial in Industrial & Engineering Chemistry for November calling attention to an article in that issue entitled "Some Economic Aspects of Industrial Research and Development," by Dr. L. V. Redman, of the Bakelite Corporation. What Dr. Redman discusses are the hazards that attend the exploitation of research; the rewards which capital must receive if it is to be induced to assume the hazards that attend the exploitation of research; the rewards which capital must receive if it is to be induced to assume the hazards of industrial development; and the approved means of keeping down the losses and keeping up the spirits while a research project is passing through "the valley of the shadow of failure." The author quotes Dr. Baekeland as saying: "Commit your blunders on a small scale and make your profits on a large scale." . . .

But profits can also be made by watching details and checking up on small leaks. The reclaiming of tin from silk weighting washings, for example, is a process that aims to retrieve some of the expense of weighting operations. An article in Chemical & Metallurgical Engineering for October discusses recent advances in reclaiming methods. One of the difficulties, the author, Gibson Butterfield, states, is the enormous quantities of water that must be treated—from 1 to 4 millions gallons daily in large weighting plants. . . .

Almost half of the current issue of Dyestuffs, the National Aniline & Chemical Company's monthly organ, is given over to an article on "The Dyeing of Glove and Clothing Leather" that appeared originally in the Journal of the Society of Dyers and Colorists. This is one subject that has not been written upon very fully. . . .

Which cannot be said for rayon . . . scarcely an issue of any textile publication that does not contain at least *one* article on the synthetic fiber. But not so much has been written about the plants where rayon is made. The Du Pont Magazine for November contains an illustrated article about the new rayon plant being erected in Richmond, Va. Details about the plant and the processes to be employed are outlined and will interest the chemist or dyer who is curious to know what planning goes into the manufacture of rayon. . . .

The Chemist in Industry

More than any other recent invention, rayon has shown the skeptics in industry what part the chemist plays in building up a profitable enterprise. No matter who takes the lion's share of credit for developing the rayon business, he must admit that he would not have had anything to develop if it had not been for the *chemist's* work on cellulose. One study in chemistry leads to another and it is common knowledge that chemical processes form the real industrial framework of every nation on earth. According to an editorial in Chemical & Metallurgical Engineering, Dr. Julius Klein of the Department of Commerce recently "told a group of editors that Germany's spectacular progress was due in a large measure to her

remarkable organization of chemical industry. The I. G. forms the cornerstone" (we said framework a minute ago) "of her entire industrial structure, and on it she is building her plans for the recapture of world markets."

References to cornerstones and framework need not be confined to an industry. In an estimate of William Whitman, New England's great wool and cotton merchant and manufacturer who recently died, the bulletin of the National Association of Wool Manufacturers declares that "He was the architect of his own fortunes" and goes on to explain that "His success . . . in our textile field was due to his dynamic force, to his thorough knowledge of the industries and his faith in their growth. . . . He was an organizer of the highest type. He knew intimately and thoroughly the intricate processes of both wool and cotton manufacture . . . he was always a student of industries and always eager to increase his knowledge of them." Surely, a tribute that cannot be applied to many men who spend their entire lives in industry; one must do more than merely spend a life. C. H.

EVENING COURSES FOR LAUNDRY OWNERS AT PHILADELPHIA TEXTILE

The Department of Chemistry, Dyeing, Bleaching and Printing of the Philadelphia Textile School has added to its curriculum an evening course of study for laundry owners and associates. This course, which opened for students October 8 and is given three evenings each week during the term, is designed to make a study of washroom supplies, the chemistry of the laundry and washroom practice, and of textiles in relation to laundering. The school's aim is to co-operate with laundry owners and their employees in the encouragement of a practical and scientific study of their industry.

The first year of the course will comprise a study of general inorganic chemistry that is basic and fundamental, and upon which succeeding instruction will be built. The matter will be presented through practical laboratory experiments, lectures and conferences.

The second year will deal with textile raw materials, their physical and chemical nature, action of various chemicals upon them, and similar technology. The last year of the course will cover an intimate study of washroom materials and factors influencing the washing problems of the laundry.

FIFTY-SEVENTH ANNUAL SILK DINNER

The fifty-seventh annual dinner of the Silk Association of America, Inc., will take place on January 17, 1929, according to an announcement received from the Silk Association headquarters.

Arrangements for the dinner will be under the supervision of the following committee: Paul Hyde Bonner, Stehli Silk Corporation; Ward Cheney, Cheney Bros.; H. P. Howell, Peierls, Buhler & Co., Inc.; H. M. Merriman, Belding, Heminway Company; J. M. Potts, E. Gerli & Co., Inc.

The Dyer's School of Experience

[EDITOR'S NOTE.—*The following narrative is one of a series being published under the general head of "The Dyer's School of Experience." Realizing that the genuine material for such a series is to be found largely among its own readers, The* REPORTER *solicits contributions from that source and will pay for those accepted at regular space rates. Among the readers of this journal there should be many who have, in the course of their experience as dyers or chemists, encountered incidents which should prove most interesting and helpful to their fellows. Send all manuscripts to* AMERICAN DYESTUFF REPORTER, *90 William Street, New York City.*]

A VINDICATION OF MY DYEING METHOD

By NOEL D. WHITE

Davenport Hosiery Mills, Chattanooga, Tenn.

A SHORT time after I had started dyeing hosiery, a demonstrator from a firm of dyestuff dealers, who had come to our dyehouse a number of times and had seen me in action, said to me: "You should not use acetic acid in your dye bath. You could do your dyeing a lot better without acid. No dyer uses acid in dyeing silk hosiery. You should try leaving it out, and see for yourself. You will get better and more even results."

This coming from a man who I supposed was an expert, sent out to demonstrate dyeing by one of the leading dealers in dyestuffs, made a profound impression on me. "Maybe he is right," I thought, "as yet I am green at this game and can learn a lot; anyway, I am always open to suggestions that may improve my work." Until then my only experience on mixed fabrics had been in dyeing ribbons and silk piece goods, and I had been taught to dye the cotton in a soap bath, or a bath with Glauber salt and soda ash to match the silk in an acid bath afterward. Here I started in by dyeing both fibers in the same bath, and could not think of leaving the acid out, and dyeing the silk in a neutral or alkaline bath. I had obtained good results right from the start, my shades were even and as far as I could see I could not improve much on my work; but maybe my adviser was right—so I decided to try.

First, however, I wished to make some inquiries, but being new to this part of the country, I did not as yet have many acquaintances, and had to confine my inquiries to the salesmen that came to the mill. Invariably I was told that no one used acid in their dyeing bath, I was the only one of whom they had ever heard doing it. As my work was giving satisfaction, I could not see that I was wrong in my way of dyeing.

One day I decided to try dyeing a lot without any acid. It was a medium tan. I used the same amount of dyestuff, and got quite near the sample except that the silk

was lighter. Having used no acid it required more dyestuff to bring up the color on the silk, some Fast Red and Azo Yellow. Ordinarily, with acid in the bath, a few grams of each would have been sufficient. I used two grams of Red and five grams of Yellow, and added it to the bath, but it made hardly any impression. I doubled that quantity and yet it was not enough. I repeated the same quantity, and finally decided to bring that color to shade in my finishing bath where I used some acid to give the required scroop. The amount of dyestuff I had to use in dyeing without acid appalled me; I was not in the habit of wasting dyestuffs, as my training had been to get the most out of my dyeing baths. One trial had convinced me that my method was better.

Our business was growing rapidly, and we had to buy new machines to increase the production. One day the boss told me he had bought a new style machine that was recommended to do the work better than any we had. When the machine arrived it was set up, and I put a lot in it to dye. I did not get good results and told the boss what I thought was wrong with the machine. He said that the man who sold it to him was in town, and would be in the mill during the day. When that gentleman arrived I told him my opinion concerning the machine, but in reply he mentioned a mill where there were a number of dyeing machines exactly that type giving satisfaction; he could not see why I could not get good results. He asked me if I wanted him to bring in an expert in hosiery dyeing, who, he was sure, would instruct me how to use that machine satisfactorily. Fine! thought I, now I would have a chance to learn from an expert on hosiery dyeing. Here was a chance for me to get some education I felt sure I needed in this business, so told him I would be delighted to see the expert.

In the meantime I learned that my new machine was perfectly adapted for boiling off my goods. The drum set into the box a little deeper than on the other machine, and revolved a little slower, keeping the degumming soap at a more constant temperature, an ideal condition for that part of processing, so I resolved that I would use the machine for that purpose. I am still using it for that only.

In due time the expert arrived; a nice, bright, likable chap. I told him what I expected him to show me and what my trouble with that machine was: I could not get my dyes to go on even.

"Let me see you dye one lot the way you do it with your other machine," he said. I told one of my helpers to prepare a lot for it and went to work to get the necessary dyestuffs. He just watched and also kept his eyes on the work that was going on in the other machines. He went to look at the work in the boarding room, never said anything, but kept watching. He also asked me a lot of questions: "Did I have much trouble with redyes, spots, uneven dyeing, and the like?" When we took a sample from the new machine it was, as usual, uneven. I told him that the drum being so deep in the bath kept it from cooling, and when we put the acid in, the bath was too hot; consequently the dyestuff had rushed on the goods, dyeing it uneven. I said that I could remedy that by keeping the bath short until the time for adding the acid had arrived, and then filling up the machine to the proper level with cold water, thereby reducing the temperature of the bath enough to be safe for the acid to work properly. He agreed that would be a good idea.

"But," I said, "I would have to change the formula on every lot that was dyed in the machine, because with a shorter bath the cotton would be dyed deeper than on the machine with a regular bath, and it would become a nuisance."

The Useless Expert

He had offered nothing up to this time. I was wondering whether he was really an expert, and what he knew about dyeing, so I asked him if he was going to instruct me in any way. He laughed and said: "Can I teach a cat to climb a tree, or a duck how to swim? You are doing as well as can be expected; you are dyeing in a way I never saw anyone else do before, but from what I can see around here—and I have been looking quite sharply at your work—I do not see where I can be of any use to you."

"Well," I said, "I have been told that no hosiery dyer uses acid in dyeing silk hosiery. Would you advise me to follow that practice and cut it out?"

"My advice to you is, keep on working the way you are now," he replied.

"But dyers around here all think I am some kind of freak, dyeing the way I do. They do not tell me directly, but once in a while the echo comes to my ears: 'How does he get by with it?' 'He may do good work but I do not agree with his method' and that kind of gossip. I am nearly ready to believe that being in such minority I must be, if not entirely wrong, antiquated in my ways."

"If any dyer could do the work in the way you are doing it, believe me, they would change and dye your way. They do not know how, they have been taught differently. You stick to your way. I have heard about you before I came down here, and was curious to know if you really needed expert advice. You need that machine anyway for degumming. The next machine you buy I would advise you to get a model like those others you have that work good for you."

When he was gone I could not keep myself from thinking of what he had said about my work. But then, why did the hosiery dyers around here not work the way I did, if, according to this man, who, I learned later, was an instructor in dyeing in a textile school and owned a hosiery dyehouse in his home town—if, I say, my way was better than theirs?

Then one day the answer was brought forcibly to my attention when I read in a textile perodical an article on on how to dye silk hosiery by three different methods.

The first two methods did not interest me; one was on dyeing in the degumming bath, the second was on dyeing after degumming in a Glauber salt bath. The third pretended to teach how to dye silk hosiery in an acid bath, and after reading it, I came to the conclusion that if anybody had ever tried to dye hosiery in an acid bath the way that the writer had explained, it was no wonder that method was not generally adapted.

What this writer averred was that the acid method "is seldom encountered," and that "only freaks or mentally unsounds would dye silk hosiery in an acid bath, because," he wrote, "by most dyers and dyestuff people it is considered rather hazardous." I heartily agreed with that writer after reading his article. If anyone had followed his information they would have got into a nice mess and no mistake. He informed the reader that the goods are first degummed as in a two-bath method; that is, they are boiled off in a soap bath for one hour or more, and then washed, but for dyeing by the acid method, however, "after rinsing once following the degumming, refill the machine with cold water and add 16½ ounces of concentrated acetic acid well diluted in cold water, for every hundred pounds of goods."

Acetic for Axel Grease

Now, if anyone has ever tried to put acetic acid in the second rinse of a lot of boiled-off silk hosiery, he may know what happened. To the uninitiated my advice is: don't do it unless you need the axle grease, or something very near like that, that will collect and float on top of that acidified soapy water.

He goes on to say, "Run in this bath (the acidified rinse) for 10 minutes, and drain. The goods should then be whizzed—," but at this stage of processing take a look at the water, and upon examination of the goods it will be found that the proper thing to do is to prepare a bath with about 3% Oakite, or 4% of soda ash, or any such solvent and at least 8% of a good grade of soap to saponify the grease that has formed in that acidified rinse, to clean his lot if he expects to dye it properly. After an experience of this kind the dyer who had ventured to try dyeing with the acid method begins to grow skeptical about that method. No wonder!

But this is not all, for we learn further that "the goods should be whizzed, shaken out, rebagged and reloaded in the machine, refill the machine with water, start the machine revolving, heat the water at 110° F., and enter the previously dissolved dyestuff, raise the temperature to a gentle boil in 15 to 20 minutes, boil for 45 minutes, then add about 10 ounces of acetic acid, run for 20 minutes more at the boil, and sample."

After reading the above I did not wonder any more that the method was called hazardous, and seldom used by dyers of hosiery. The writer of the article suggested adding the acid while the bath is at the boil, which in itself is a dangerous practice. It goes in to acidify that bath at a time when conditions are such that a rapid absorption of dyestuff by the silk is most favorable. The color rushes on to the outside of the goods, and an uneven job is certain to result, because the bath will be rapidly exhausted; before the goods in the center of the bags have had a ghost of a chance to take up any dye, there is none left.

Naturally, any dyer that had read that article would have been wary to try it out because of the assertion that it was hazardous, and not recommended by dyestuff dealers, but I am willing to bet a hat that if any dyer will try my way of dyeing with acid (the way I started myself, because I did not know of any other way, but that proved to be quite satisfactory from the start), after seeing the results he will not go back to any other methods. Of course, I know I am talking to the winds, but here is how I do it, how I "get by with it," as someone has said:

In boiling off, it is immaterial (providing it is done thoroughly) whether soap, degumming oil, caustic soda and Protectol, or any other suitable agent is used. The most important feature is to remove all the gum from the silk and rinse well; not once, but in three rinses of warm water, 15 to 20 minutes for each rinse, and the goods whizzed. Straighten out the hosiery, put them in their colored bags, and they are ready to be dyed. To dye well the goods should be well prepared.

When in the machine ready for dyeing, bring the water in the machine just up to the shaft holding up the drum, raise the temperature to 120° F., and put in the dyestuff necessary for that particular shade, well dissolved and strained; raise to the boil and boil 20 minutes, then close the steam, put in the necessary Glauber salt, from 5 to 40 per cent, according to the quantity of dyestuff used, and it is better to put in the salt in two equal portions at 10-minute intervals. Notice that I said *"close the steam before entering the salt."* Now keep the steam closed, and let the machine run for 20 minutes after the whole amount of salt is in the bath. At this time the temperature of the bath should have come down to 150° F.; if not, let it run longer until it is no more than that, and add from 1½ to 2% of acetic acid, 28% strength, run 10 minutes longer, then raise to the boil and close the steam. After 20 minutes sample.

It may be argued that the operation as outlined takes too much time, to which I will answer that when it is taken into consideration that in this way the dyeing is under perfect control at all times, that the different fibers are given time to get the dye as they should, and that when a formula is established there is nothing but a miscarriage of instructions that makes it necessary to add any dyestuff to a lot being dyed, I find that the dyer is reasonably sure to complete a job in a given time. One and a half hours to two hours is all the time it takes us to complete a job of 50 to 200 pounds lot of silk hosiery.

This is my reasoning of what takes place (it may not be scientifically expressed, but is what happens). In boiling the goods in the bath without any assistants, the

dyestuff gets equally divided and through the goods; in twenty minutes the lot should have been well and evenly covered. When the salt is added, most of the dyestuff is taken up by the cotton and a little by the silk, until the cotton is nearly to sample and a little darker. When the time comes to put the acid in the bath, this is at a temperature that is quite safe; there is no more danger that the dye will rush on the silk too rapidly, not only for that but because at this time the bath is nearly exhausted, except when very dark colors are being dyed, and what little is left goes slowly on the silk.

When the bath is boiled for the last time some of the dye drops from the cotton and is absorbed gradually by the silk, while the bath is cooling previous to sampling.

There may still be dyers that scoff at my method, but the fact remains that we are doing it successfully and, in the words of a friend who recently reported to me a conversation he had with a colleague about my way of dyeing: "You may not agree with him, but look at his results."

There are a few things, however, I must caution my reader against, if he would obtain good results in using my method of dyeing. The object is to get the most out of the direct colors; some of them are supposed to color the cotton, leaving the silk white, others to dye both silk and cotton more or less alike, but on using acetic acid in the bath it will be found that all of them may be made to go on the silk also; so in using the old formula the dyer who learned dyeing without the aid of acetic will find that a few trials in the laboratory are essential in order to find out what to leave out, and what to reduce in weight in order to obtain the same results, because it is a foregone conclusion that considerably less dyestuff is necessary.

Taking advantage of what direct color may be pushed on the silk, most of the silk dyes can be eliminated, and the small amount necessary to get a good union may be determined after a trial or two in a beaker; if any addition has to be made it can be safely done in the bath even at a high temperature.

To carry on the experiment at the start I would advise the use of the old formula, leaving out all neutral and acid dyes and making a sample with only the direct colors entering the combination to see how near the sample it is possible to arrive at without any silk dyestuff, and then match the silk in the same bath to a good union. After a few trials in the laboratory I am quite confident that any dyer with some experience in using dyestuff can make himself so familiar with the use of acetic acid that he will never dye any more silk hosiery without it.

He will then be able to make a pound of Neutral Red or Neutral Gray go three or four times as far as he is able to do now; he will find out that a good many direct dyes, supposed to dye only the cotton part of the stocking, will dye the silk also, and he will also find that his colors are much faster to washing than before, because it is a well-known fact that direct colors dye the silk faster than the cotton.

Direct Colors on Silk

It may be found in experimenting that some direct colors dye the silk darker or somewhat different from the cotton, and the dyer may become alarmed thinking that particular dyestuff unsuitable for some shade. There is no cause for worry on that score.

In such a case it is necessary to keep the bath on the alkaline side to give the cotton a chance to absorb more of that dyestuff, and retard the absorption by the silk. One per cent of phosphate of soda added to the bath at the beginning is all that is necessary, and this will in no way interfere with the dyeing which may proceed in the usual way as outlined above, the phosphate having performed its function by the time the acid is entered.

Now, I do not expect any one of my colleagues to adopt my method of dyeing hosiery. I know that dyers as a rule have set ideas as to how they want to work, and it is very hard to convince them to make a change unless it is a very radical one such as we had when we went from wood, root and berry dyes to the coal tar colors. That brings to my mind the story of the old dyer who was working in a mill where they were starting to use some rayon in their hosiery. When told that he had to learn how to dye the new fiber he said: "Let the other men learn that; I quit."

I am not quitting yet, however, and if some one of my readers cares to take up the cudgel and show me where I can profit by making a change, I am yet willing to learn. So come on in, boys, let's give this a thrashing out—we will all be the better for it.

CAROLINA TEXTILE SCHOOL STUDIES OIL SPRAYING

Among the processes introduced during the past few years for the treatment of textile fibers few have created as much discussion as the oil spraying of cotton, because of numerous questions which such treatment raised for the textile manufacturer and dyer. In order that Southern mills may make tests of oil spraying results, the Textile School of North Carolina State College has installed in its laboratories a Breton minerol process, developed by the Borne, Scrymser Company, of New York, lubricant manufacturers.

HEARD IN DYE HOUSE

Foreman—And in that large room in the rear we have several dyeing vats.

Lady Visitor—Oh, isn't that a shame! And can't you do a thing for them? —*Lehigh Burr.*

Technical Notes from Foreign Sources

Preparation of Cellulose Esters

English Patent No. 284,298, *I. G. Farbenindustrie A. G.*—The products of English Patent No. 283,181 may be further esterified by treatment in a liquid medium with an acid, an acid anhydride, or a salt of a strong acid with a weak base. The products dissolve in the ordinary organic solvents, the solutions flow well, and can be worked into soft and elastic films. The medium employed for the reaction may be either the solvent desired for the product, or a solvent for the original cellulose ester, or in some cases the acid or anhydride used as the reagent for the transformation. In some cases a critical temperature must be passed in the reaction before the desired alteration in solubility takes place.

Wetting Agents

English Patent No. 283,864, *Oranienburger Chem. Fabrik A. G.*—The action of halogen-sulphonic acids (both sulphonating and dehydrating in action) upon mixtures of acids or hydroxy-acids of low molecular weight with aromatic or hydro-aromatic hydrocarbons, especially polynuclear hydrocarbons such as naphthalene, anthracene, and their derivatives, yields sulphonic acids of the latter with the radical of the acid employed attached to the hydrocarbon ring. The products are useful as emulsifying agents. They can be used alone, or with water-soluble alcohols, ketones, etc.

Amidized Cellulose

English Patent No. 284,358, *Chem. Fabrik vorm. Sandoz.*—Cotton goods in any form are treated simultaneously with (a) the chloride of a sulphonic acid—as, for example, those derived from benzene or toluene, or benzyl- or ethyl-sulphonic chloride—and (b) a tertiary base, either aliphatic, aromatic or heterocyclic. Also, the material may be treated with the product of reaction of the sulphon-chlorides and the tertiary bases. Inert solvents, as nitrobenzene, may be present. Examples are given for cotton, mercerized cotton, viscose, cupro- and nitro-silk.

Dyes for Cellulose Esters or Ethers

English Patent No. 284,652, *I. G. Farben-Ind. A.-G.*—Dyes suitable for cellulose esters or ethers are prepared by coupling diazo components to substituted or unsubstituted cyclic compounds, which contain a benzene ring condensed with a five-membered heterocyclic ring, in which there is one hydrogen capable of reacting with the diazo compound. Such compounds are beta-keto-cumarane, oxindole, hydroxy-thio-naphthene and methyl-ketol. There must be present in the finished dyestuff not more than one sulphonic or carboxylic group.

Fastness of Dyed Fabrics to Laundering

R. G. Parker and D. N. Jackman, J. Text. Inst. T 223, 19 (1928).—A full and systematic summary of the topic, too condensed in the original to be capable of being abstracted.

Washing of Cotton Goods Dyed or Printed with Turkey Red

H. Pomeranz, Textil-Chem. u. Colorist (Deutscher Faerber-Ztg.), 61, 9 (1928).—In an earlier article the author gave expression to the fundamental idea that "the washing of the dyed or printed fiber is the continuation of the dyeing process; consequently there must be as many methods of washing as there are methods of dyeing. Each of the latter requires a method of washing corresponding to it" (we should perhaps express the sense rather by saying "'dependent upon the nature of the dyeing process which has preceded"). In the previous article mentioned, the author discussed the washing of fabrics dyed with Indigo. This present one takes up the washing of Turkey Red dyeings.

"Since the introduction of red azo-dyestuffs produced on the fiber, and to some extent the red vat dyestuffs, alizarine or Turkey Red dyeing has lost much in importance, yet even to-day such dyeings belong to the group of the fastest dyes. It is still dyed and printed in large amounts in many countries. It was the careful investigation of Turkey Red which led to the recognition of the conditions necessary in mordant dyeing, and the subject is still of interest and importance.

"The red color-substance which is produced upon the fiber from the alizarine dyestuff and the metallic mordant (alumina, lime or tin oxide) is so constituted that it enters into combination with the fiber, according to the theories of dyeing. The color-substance itself we conceive of as a ligneous or lake-like compound of the alizarine dyestuff with the metallic oxide, although such a compound, in the sense of classical chemical theory, is essentially distinct from the dye-substance. An explanation of this may be found in the colloidal character of the latter. Further, experience has shown that the complex mordant-dyestuff must associate with itself a third constituent, in order to bring the actual dyeing into suitable usable condition; and this third constituent is formed by the higher fatty acids.

"Investigation of the chemical constitution of this red pigment has not afforded a clear chemical picture of either the mode of combination of the dyestuff or the fatty acids with the metallic mordants. It may quite properly be assumed, however, that, while the dyestuff forms a kind of phenolate with the metallic oxides, the

fatty acid forms a metallic soap, and the dyeing is completed in two operations, in one sense, in two simultaneously operating baths; in one, which contains the finely divided, suspended alizarine, and the other, the dissolved fatty acid, whether in the form of Turkey Red oil or as soap; in any case dissolved colloidally.

"The latter dyeing takes place, as a rule, simultaneously, by two procedures: printing and subsequent steaming under pressure, and 'dyeing in a fat-bath'—through soaping. This is in brief the principle, disregarding the removal by solution of the insufficiently fixed dye substance. This summary leads logically to the proposal of the following two questions: (1) What fatty acids are suitable for mordant dyeing? (2) How should they be dissolved in order that they may correctly fulfill their task? The first question one may answer with certainty—Turkey Red dyeing is not limited to a particular fatty acid. The brightening of the color can be accomplished satisfactorily by saturated or unsaturated or hydroxylated fatty acids; variations (in results) may certainly be noticed, but are not of decisive nature. On the other hand, the manner in which the fatty acids are brought into reaction is of high importance. The oiling and soaping are considered together; each has the same purpose. In each case a reaction of the fatty acids with the metallic oxides is sought, which takes place through direct action of one upon the other, as well as through the double decomposition taking place between the alkali soaps and the metallic salts. Now, alizarine dyestuffs, as is known, form various salts with different metallic oxides; with alumina, red; with chromium hydroxide, brown; with ferric hydroxide, dull violet; with the alkalies (K, Na) they form blue-violet, water-soluble salts. Any action of alkalies upon the alizarine red lake influences unfavorably the beauty of the red dyeing. Most soaps are dissociated by water into acid fatty-acid salt and free alkali. For alizarine red dyeings it is therefore advisable to make it possible for the fatty acids to be taken up only from aqueous solution, in order to avoid the harmful effect of alkali. Thus one arrives at the fundamental idea of the sulphonation of fats with concentrated sulphuric acid; this idea consists in the preparation of a somewhat acid soap from which by dissociation no akali can be split off. It has been found that an actual stoichiometrically accurate combination of fatty acids with sulphuric acid should not be used in Turkey Red dyeings.

"Oiling of the dyeings—that is, impregnation with Turkey Red oil solutions and subsequent steaming—has for its purpose the fixation of the necessary amount of fatty acid upon the dyed fiber. What remains unfixed, and what can be further introduced into the lake in the wet way, is taken care of by hot soaping. This soaping with a soap which is as acid as possible and as difficultly dissociable as possible, at a high temperature, until the dyeing is saturated with fatty acids, and the unfixed acids are dissolved off, might serve as the definition of the washing process for cotton goods dyed with Turkey Red. It is distinct from that of goods dyed with Indigo, in the same way as Turkey Red dyeing is distinct from vat-blue dyeing. The soaping takes place, as a rule, in tubs.

"In conclusion, something should be said on the subject of textile soaps. Under this title much material is misused, which is partly to be excused by the fact that the soap maker cannot exactly know beforehand the possible ways in which his product will be used. A soap which is employed for the soaping of goods dyed with Indanthrene Blue can naturally contain very much free alkali, while such a soap should not be used for goods dyed with alizarine red. Soaps should be designated as neutral superfatted, etc. More advantageous would be a technical classification corresponding to the use to which the product might properly be put. We should then have available commercially a 'Turkey Red soap,' which, at least in textile technique, would always be used for the purpose intended. A strongly acid Monopole soap, of course, not prepared from the costly castor oil, would be such a textile soap, meeting exactly the requirements of Turkey Red dyeing."

Lester McNerney, who has been covering the Middle Western territory, with headquarters at Pfaltz & Bauer's Chicago office, has been transferred to California, where he has taken up the duties of vice-president and manager of the Pfaltz & Bauer Chemical Company of California, Inc., 683 Antonia Street, Los Angeles, a subsidiary of Pfaltz & Bauer, Inc., New York City.

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